



Initial Design Concept Report

# State Route 189, International Border to Grand Avenue

Nogales, Santa Cruz County, Arizona

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## Executive Summary

The Arizona Department of Transportation (ADOT) is the sponsor of a proposed action, the construction and operation of corridor spot improvements and a revised service traffic interchange (TI) at Interstate (I-) 19 and State Route (SR) 189 in Nogales in Santa Cruz County, Arizona. ADOT is working in close consultation with the Federal Highway Administration (FHWA), the lead federal agency, to develop an environmental assessment (EA), design concept report (DCR), and change of access request for the proposed action.

In June 2014, the State Transportation Board adopted the 2015–2019 Five-Year Transportation Facilities Construction Program. The SR 189: International Border to Grand Avenue project is currently identified in the ADOT Five-Year Transportation Facilities Construction Program. The State Transportation Board allocated \$2 million for environmental work in fiscal year (FY) 2016 and \$4 million for design in FY 2018. Funding was originally programmed in the 2020–2024 Development Program for \$64 million in FY 2021. In September 2016, a \$25 million appropriation was passed by the Arizona Legislature. In addition, \$40 million in federal funds will go toward SR 189 improvements for construction to begin in FY 2019.

## Alternatives Development and Screening

This report describes the development and evaluation of three corridor alternatives(Corridor Management, Connector Route, and Expressway) and six I-19/SR 189 (Mariposa) TI options. The corridor alternatives have been presented to the public and the stakeholders through many outreach activities, starting with the May 2011 agency scoping meeting and continuing with stakeholder meetings in June 2011, September 2011, and April 2012; a public meeting in May 2012; and a stakeholder meeting with area property owners and business interests in June 2012. In August 2012, the City of Nogales passed a resolution supporting the selection of the Corridor Management alternative. The Board of Supervisors of Santa Cruz County provided similar support for the Corridor Management alternative. Similarly, the corridor access management alternative rated the highest in project implementation, cost, and regional plan consistency. Subsequently, the study team identified the Corridor Management alternative with options as the Recommended Build Alternative. This recommendation is supported by local agency stakeholders and the public.

Based on the planned funding identified in FY 2019, in order for the build alternative to be developed that incorporates the stakeholders input, an alternative was developed that could be constructed in phases. The first phase will be called the Interim Condition. This phase will implement improvements along the corridor and provided an at-grade eastbound SR 189 to northbound I-19 ramp. When additional funding is available, the second phase of construction will be called the Phase Ultimate Condition. In this phase, the eastbound to northbound ramp previously constructed in the interim phase will be reconstructed to be grade-separated over Frank Reed Road. In addition to the reconstruction of this ramp, a new southbound I-19 to westbound SR 189 flyover ramp will be constructed and be grade separated over Frank Reed Road. Based on stakeholder input and technical evaluations, a split multidirectional flyover ramp layout is recommended. The split ramp layout provides flexibility in the phasing of key flyover components based on the funding available. Section 3.0, *Evaluation of Alternatives*, in this report further documents the decision process to identify the TI options for the Recommended Build Alternative, which will incorporate an Interim and an Ultimate Condition. The Interim and Ultimate Conditions are presented in Figures ES-1 and ES-2.

Figure ES-1. Interim Condition

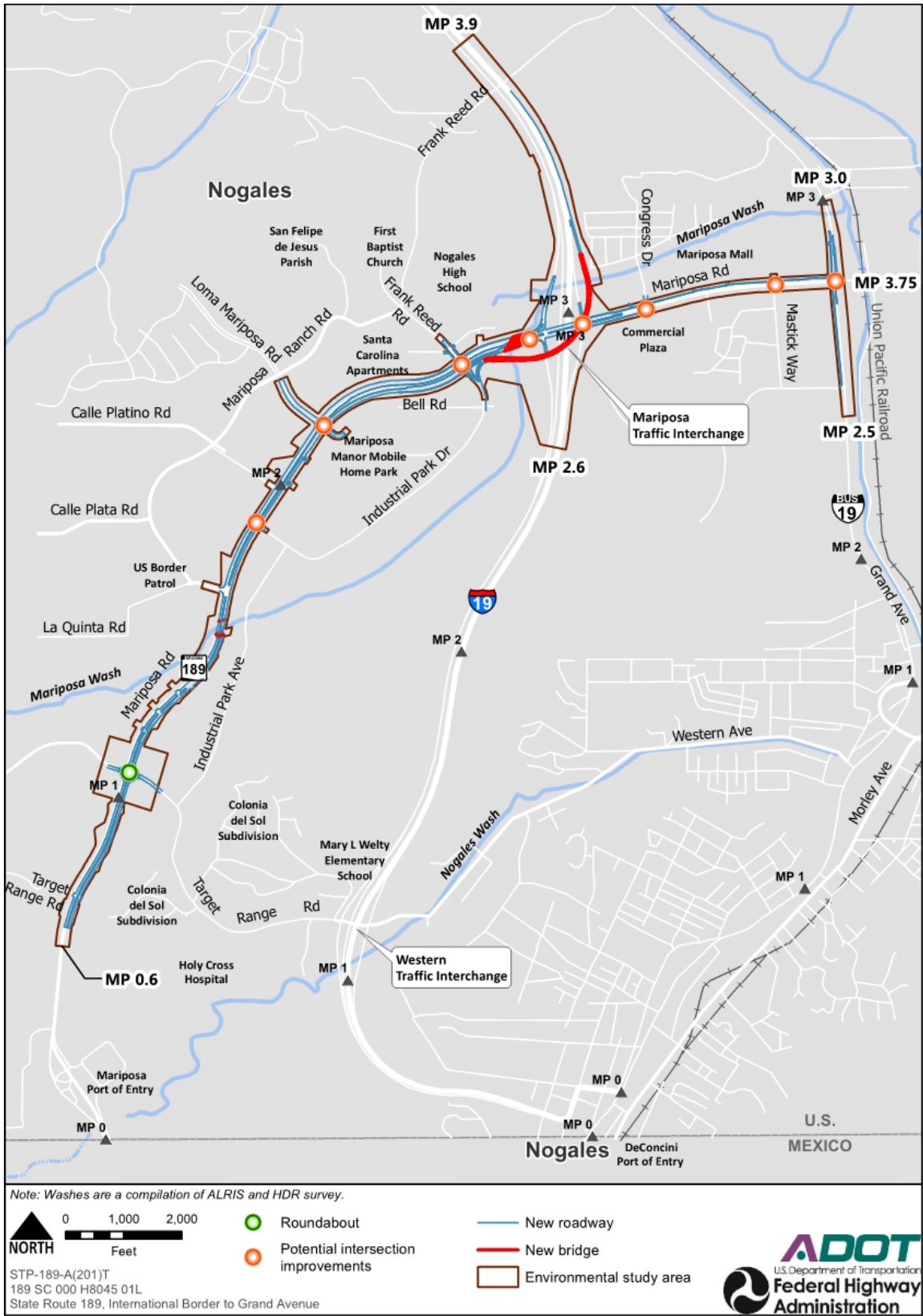
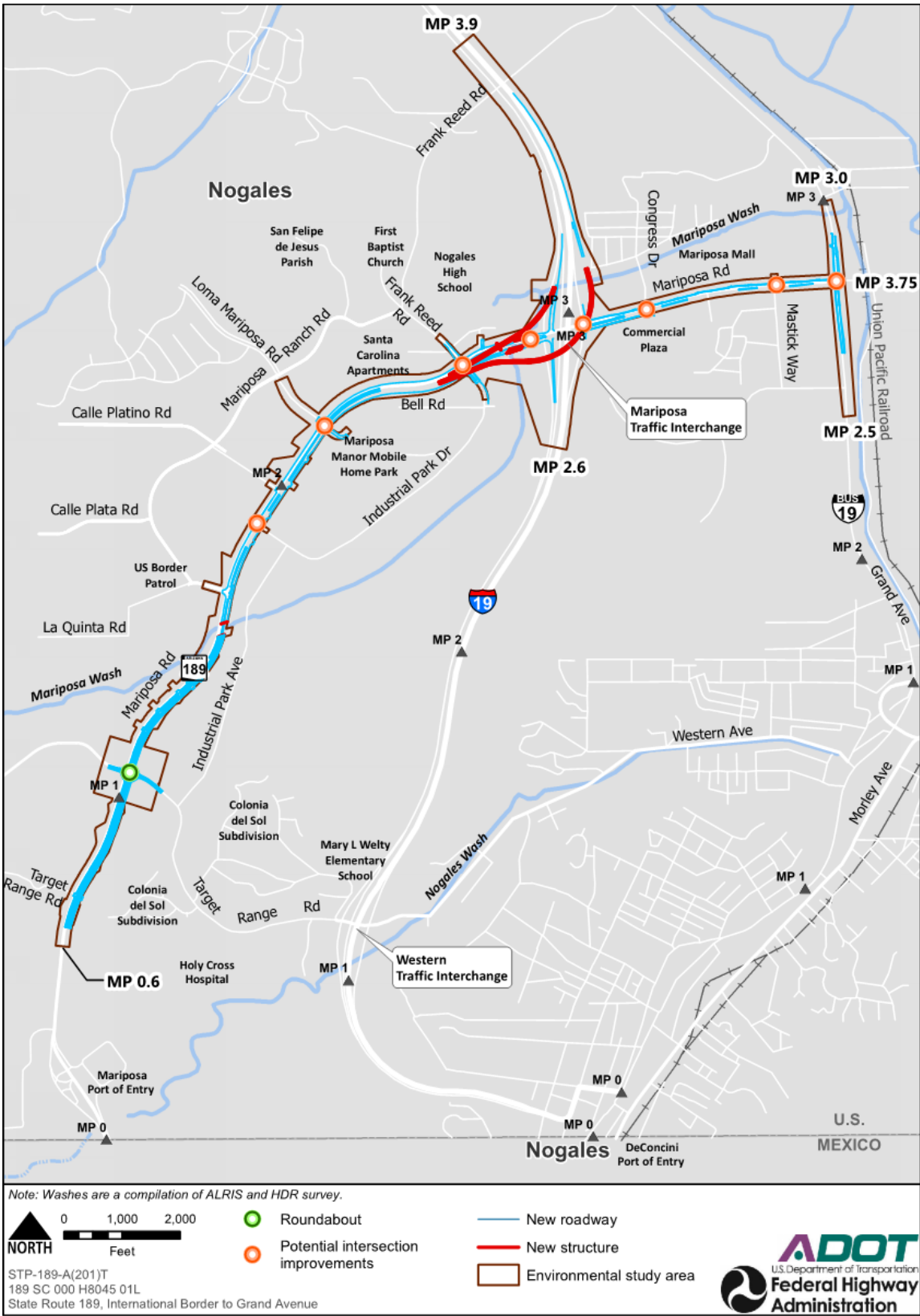


Figure ES-2. Ultimate Condition



Programmed and Estimated Cost

Three estimates for the Recommended Build Alternative have been developed for the Interim, Ultimate Conditions and the phased Ultimate. The estimate of probable project costs for constructing the Ultimate Condition is \$133.8 million (2016 dollars). This estimate includes \$86.8 million for construction, \$5.3 million for design, \$10.3 million for Indirect Cost Allocation Plan (ICAP), and \$31.4 million for right-of-way. The State Transportation Board has approved \$2 million for environmental work in FY 2016 and \$4 million for design in FY 2018. Funding for construction is programmed for \$65 million in FY 2019.

A public meeting was held in November 2014 to seek public input on six TI options. Public feedback on the TI options was documented and—based on the ratings, technical analysis, stakeholder and public feedback—a multidirectional flyover at the Mariposa TI is recommended that includes a grade-separated structure over the Frank Reed Road intersection. The Ultimate Condition plan includes these features and has the support of local stakeholders because it separates the heavy truck movements destined for I-19 or the border from local traffic at the Frank Reed Road intersection.

The Ultimate Condition, which incorporates the stakeholders' input, has a funding shortfall when compared with the funding currently programmed in FY 2019. Stakeholders have expressed a desire to look for additional funding options that could make up the funding shortfall. With the current design, an Interim Condition can be implemented for the programmed year. When funds become available for the Ultimate Condition, the improvements will be implemented at that time. At this time, there is no time frame for when the funding shortfall could be addressed. The estimate of probable project costs for constructing the Interim Condition is \$60.4 million (2016 dollars). This estimate includes \$48.3 million for construction, \$2.9 million for design, \$4.7 million for ICAP, and \$4.5 million for right-of-way.



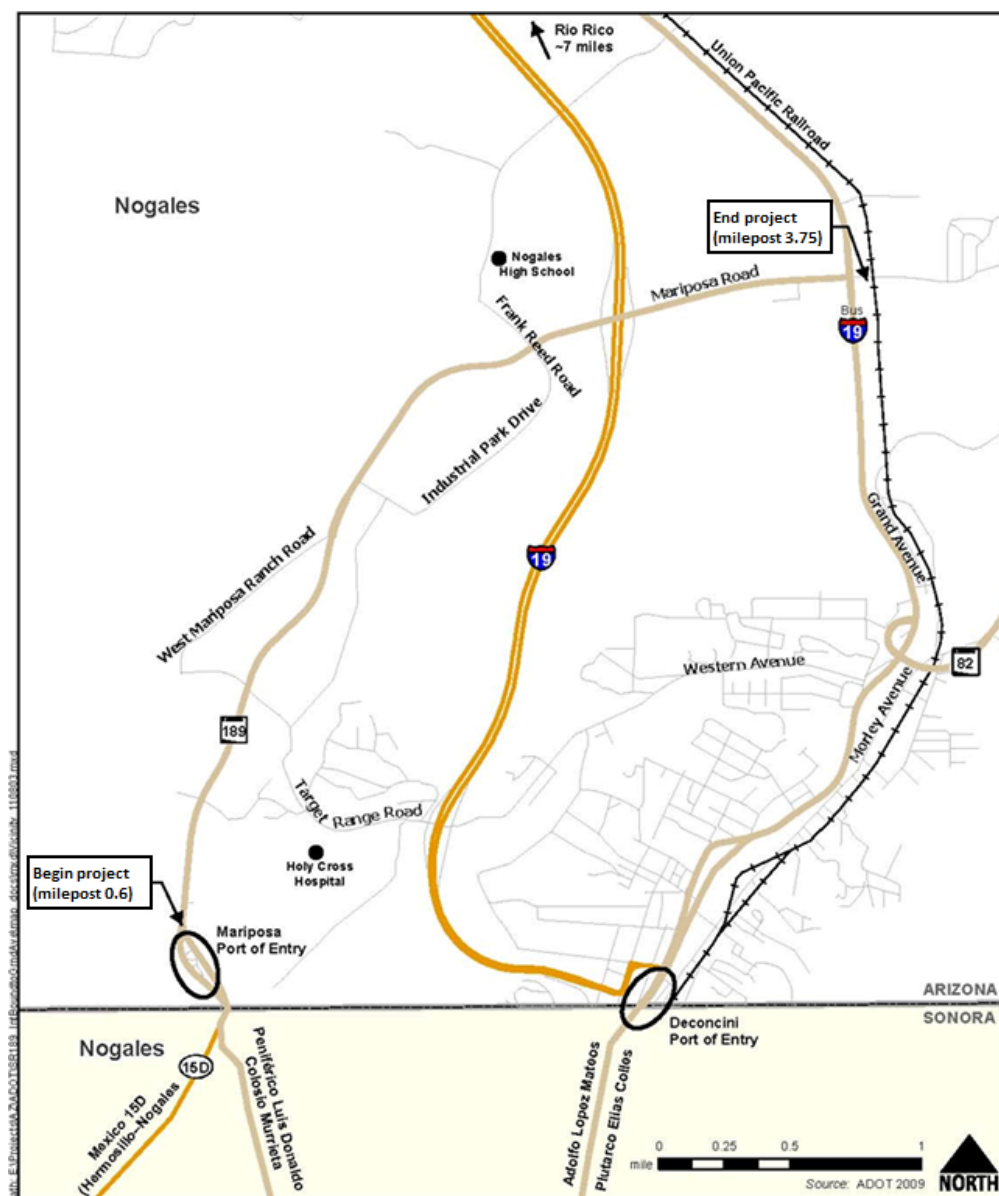
## 1.0 Introduction

### 1.1 Project Location

The study corridor is located in the City of Nogales, in Santa Cruz County, Arizona (Figure 1-1). The study area extends from milepost 0.6 at the Mariposa Land Port of Entry (LPOE) on SR 189 and extends north beyond I-19 to milepost 3.75 at Grand Avenue (also known as Business I-19 [B-19] or Tucson–Nogales Highway). Industrial development and areas of undeveloped land characterize SR 189 between the LPOE and I-19. Between I-19 and Grand Avenue, SR 189 passes through a commercial area that includes two large shopping centers.

I-19 runs generally north beginning at the U.S.-Mexico international border and ending in Tucson at the I-19 and I-10 traffic interchange.

**Figure 1-1.** Project location



### 1.2 Project Background

SR 189 connects the Mariposa POE at the U.S.-Mexico border with I-19 and Grand Avenue in Nogales. The purpose of the proposed action is to increase traffic-carrying capacity by improving the SR 189 corridor—especially at the Mariposa TI—and to improve operational efficiency by enhancing access control, improving intersections, and completing selected areas of roadway widening.

I-19 is a section of the CANAMEX Corridor, which connects Mexico, the U.S., and Canada. The CANAMEX corridor consists of a myriad of existing Interstate corridors and state highways. Through the Moving Ahead for Progress in the 21st Century Act, a transportation authorization bill signed into law on July 6, 2012, Congress recognized the importance of the portion of the corridor between Phoenix and Las Vegas and designated it as the future I-11. I-11 is intended to be a new high-capacity, multimodal transportation facility connecting the two cities. Extended, it has the potential to become a major multimodal north-to-south transcontinental corridor through the Intermountain West, connecting cities, trade hubs, ports, intersecting highways, and railroads.

CANAMEX was redesignated as I-11 in accordance with Fixing America's Surface Transportation Act, signed into law on December 4, 2015. At the same time, it extended the southern terminus of the I-11 corridor from Phoenix through Tucson to Nogales.

Implementation of I-11 would fill a significant gap by providing travel continuity—allowing significant commerce, tourism, and international trade opportunities across the western U.S., thus enabling economic development.

It is important to note that future planning, design, and NEPA documentation will determine more defined and specific I-11 route corridor alignment locations.

The proposed improvements to SR 189 are an important initial component to beginning the process of developing the groundwork for the future I-11 corridor. As noted later in Section 1.2, under *Meeting Transportation Planning Objectives*, in the *Supporting the CANAMEX and I-11 Corridors* subsection, upgrading and improving the SR 189 corridor is a critical first step in taking advantage of the Mariposa POE expansion in 2014 to increase trade capacity between the U.S. and Mexico with a much-improved transportation facility within a short-term timeframe.

#### Existing Conditions

The Mariposa POE is on the U.S. side of the twin cities of Nogales, Arizona, and Nogales, Sonora, Mexico; the two are known locally as *Ambos Nogales* (both Nogales). Nogales, Sonora, has a population of well beyond 200,000 and is the third-largest city in the Mexican state of Sonora. The population of Nogales, Arizona, according to the 2010 U.S. Census, was just under 21,000. Nogales is one of Arizona's largest international border towns.

#### Nogales Ports of Entry (DeConcini and Mariposa)

Nogales has both the Mariposa and DeConcini POEs within its city limits. They are approximately 1 to 1.5 miles apart, with the Mariposa POE located farther west. The DeConcini POE connects directly to Grand Avenue (Business I-19), which connects to I-19 just north of the POE. The Union Pacific Railroad (UPRR) Nogales

Subdivision Railroad also moves through the DeConcini POE. It links to the UPRR Sunset Route, which generally parallels I-8 and I-10 in an east-to-west direction to the north, with Ferrocarril Mexicano (Ferromex) railroad corridor that travels south into Mexico at the DeConcini POE.

Arizona had \$8.6 billion in exports to Mexico in 2014, which was a 22 percent increase over 2013’s \$7.2 billion. Arizona’s exports to Mexico have increased steadily since 2009, growing at rates between 4 and 22 percent annually. Much of this growth has been manifested through the Mariposa and DeConcini POEs. In 2014, the state of Sonora obtained \$332.6 million in direct foreign investment, a 148 percent increase over 2013. Such investment brings additional capital, creates jobs, and encourages the transfer of technology to the host country. Benefits to investor countries include access to an expanded labor force and expanded opportunities for promoting products in international markets (Pavlovich-Kochi 2015).

In 2014, these POEs accounted for 82 percent of northbound truck crossings and 40 percent of northbound personal vehicle crossings of the six POEs in Arizona. The largest share of the trucks and personal vehicles crosses through the Mariposa POE (Pavlovich-Kochi 2015). In addition, there were 866 train crossings through the DeConcini POE and 8,699 bus crossings primarily through the Mariposa POE (ADOT and Nevada Department of Transportation [NDOT] 2014a).

**Mariposa Port of Entry**

The Mariposa POE is one of the 10 busiest cargo ports along the U.S.-Mexico border and is responsible for processing, inspecting, and crossing the most significant share of commercial freight trucks, other commercial vehicles, buses, personal vehicles, and pedestrians. The DeConcini POE is responsible for all train traffic and lesser amounts of trucks, personal vehicles, pedestrians, and buses (General Services Administration 2015).

This proposed action would focus on the Mariposa POE with its direct connection to SR 189. The Mariposa POE is a full-service facility responsible for providing customs inspections of commercial vehicles (trucks and buses) and privately owned vehicles (POVs), and for processing the papers of individuals wishing to enter the U.S. Key facts regarding the Mariposa POE (General Services Administration 2015) include the following:

- It is the busiest land port in Arizona for POVs.
- 2,832,290 northbound POVs are processed each year.
- 312,000 northbound commercial vehicles cross each year.
- 3,238,929 northbound pedestrians cross each year.
- It is the main entry point for fresh produce originating from Mexico and destined for the West Coast, handling nearly half of all agricultural commodities entering the U.S. from Mexico.

Approximately 312,000 heavy-duty commercial trucks annually pass through the Mariposa POE. Truck crossings through the Mariposa POE increased by 26 percent between 2004 and 2014 (Pavlovich-Kochi 2015). Most of

the trucks crossing through the Mariposa POE primarily transport agricultural products. Agricultural trade surges in the winter, with a peak volume of 1,400 incoming trucks per day (Every Truck Job 2011).

In 2010, FHWA conducted a study using integrated data sources to show freight movement between the U.S. and Mexico. The Freight Analysis Framework 3 2010 data provided forecasts through 2040. As shown in Table 1-1, the Freight Analysis Framework 3 projections show that the dollar value of annual imported and exported freight activity through Arizona’s ports with Mexico—including the Mariposa POE—is expected to more than quadruple by 2040.

**Table 1-1.** Dollar values for United States-Mexico freight traffic through Arizona ports

Description	2009		2040	
	Weight (000s tons)	Value (millions 2009 dollars)	Weight (000s tons)	Value (millions 2009 dollars)
Import freight	4,513	10,755	13,524	38,028
Export freight	4,769	6,980	18,964	36,425
<b>Total freight</b>	<b>9,282</b>	<b>17,735</b>	<b>32,488</b>	<b>74,453</b>

Source: Federal Highway Administration (2010)

To provide for the forecast growth, in 2014 the Mariposa POE was expanded and modernized to keep pace with the anticipated growth in traffic using the facility. The expansion project added approximately 216,000 gross square feet to the Mariposa POE, and it can now process approximately two times the current volume of traffic. Key expansion efforts (General Services Administration 2015) included:

- Commercial primary booths were expanded from 4 to 8 booths.
- Commercial secondary inspection dock spaces were expanded from 33 to 56 spaces.
- Commercial exit booths were expanded from 2 to 5 booths.
- POV primary inspection booths were expanded from 4 to 12 booths.
- POV secondary inspection spaces were expanded from 4 to 24 spaces.
- New northbound pedestrian processing walkways and inspection facilities were added.
- Five new outbound inspection booths and supporting outbound buildings were added.

**State Route 189**

From the Mariposa POE to Grand Avenue, SR 189 is classified as a Principal Arterial street with a five-lane, undivided road with paved shoulders. It has two travel lanes in each direction separated by a center turn lane. Access to SR 189 is unrestricted. Two arterial streets, two collector streets, approximately eight local streets, and approximately 30 driveways connect directly with SR 189. SR 189 links to Grand Avenue, a principal arterial street at the northern terminus of the proposed action (ADOT 2008a).

Traffic moving through the Mariposa POE primarily uses SR 189 to gain access to I-19 or Grand Avenue. From 800 to 2,800 commercial freight trucks, daily, are destined for nearby warehouses in Nogales or Rio Rico to offload freight for storage and transfer to U.S.-registered trucks for distribution. In addition to Mariposa POE traffic, from 4,500 to 18,000 trucks of all types and POVs use SR 189 daily to gain access to Nogales High School, commercial services, warehouses, employment centers, and nearby residential areas (Chowdhury and Gorton 2011). East of Industrial Park Drive, trucks of all types and POVs traveling to local destinations make up 47 to 60 percent of the total traffic volume (Chowdhury and Gorton 2011). Local area growth in Nogales and the surrounding region has also caused increased travel demand in the area. Based on plans for currently undeveloped land, growth is expected to continue (Chowdhury and Gorton 2011).

Under existing traffic conditions, key roadways that intersect with SR 189 experience longer delays during the peak midday travel periods, including Frank Reed Road, both the south- and northbound ramps to I-19, and Grand Avenue; they currently operate at level of service (LOS) E, F, E, and E, respectively. With the expected increase in travel demand from both the Mariposa POE expansion and growth in local traffic, SR 189 corridor traffic operations and LOS are forecast to experience continued deterioration. Since SR 189 is a key link for the movement of goods and people between Mexico and the U.S., maintaining acceptable traffic operations in the corridor is critical for keeping the Nogales produce warehousing and manufacturing operations competitive in the global marketplace.

### Meeting Transportation Planning Objectives

ADOT has recognized the importance of SR 189 as a critical link in the transportation system network for accessibility, mobility, efficiency, and LOS to improve the movement of goods, services, and people along this important trade route between the U.S. and Mexico. A number of recent studies have been completed to validate improvements to the SR 189 corridor as an important transportation planning objective; these studies are summarized below. The widening of SR 189, improvement of the Mariposa TI, and improvement of operational efficiency of the roads that intersect SR 189 through various measures were recommended in these documents for further study.

#### ***Mariposa/I-19 Connector Route Study: Final Report (ADOT 2008a)***

ADOT's Connector Route Study was a seminal study of the future SR 189 corridor. It identified three alternatives for improving SR 189 to accommodate anticipated traffic growth. These alternatives included improving the existing SR 189 and building new connector routes between SR 189 and I-19 on two possible alignments. The study also examined three options for the Mariposa TI that included a diverging diamond interchange (DDI), a partial cloverleaf interchange, and a flyover ramp. The study concluded that improvements to existing SR 189 and the Mariposa TI could accommodate anticipated 2040 traffic at an acceptable LOS, and it identified the corridor improvement and access management alternative as the preferred corridor type.

This study included plans for adequate road capacity and safe traffic movement to and from the Mariposa POE. More specifically, the Connector Route Study evaluated the need for improved capacity and safety of the existing SR 189 and the feasibility and possible routing of a new road to connect the Mariposa POE with I-19. The Connector Route Study indicated that:

- Improvements are needed to the Mariposa TI to provide additional capacity; a system-wide approach is needed to collectively address traffic at the TI and east of I-19.
- SR 189 needs to be widened to increase capacity and accommodate traffic associated with existing and projected Mariposa POE traffic, as well as local traffic. Widening is needed from the Mariposa POE to east of I-19 because upwards of 1,600 commercial freight trucks a day (Chowdhury and Gorton 2011) are destined for Grand Avenue and locations east of I-19 during the peak season.
- By 2030, traffic volumes on SR 189 are expected to exceed the capacity of a five-lane principal arterial street; proposals for widening SR 189 should also evaluate options to limit access and means to reduce traffic volume on SR 189, such as a reliever route for commercial freight truck traffic.

#### ***Mariposa Port of Entry Bottleneck Study (University of Arizona 2008)***

The bottleneck study focused on areas that impede the efficient movement of goods across the border and recommended low-cost, high-impact solutions. A *bottleneck* is a point where traffic flow is impeded; in this context, traffic must stop at the POE for inspection, which slows down traffic flow. At the Mariposa TI, the bottleneck study recommended re-timing the traffic signals, adding an additional left-turn lane, and widening the northbound on ramp. At Grand Avenue, the study recommended extending the southbound right-turn lane to improve traffic flow. Signal timing improvements were recommended at the Frank Reed Road/SR 189 intersection. Long term, the study recommended a new direct connection between Frank Reed Road and I-19.

#### ***City of Nogales General Plan (City of Nogales 2010a)***

This plan acknowledges the heritage of Nogales, Arizona, and the complex urban fabric that the city shares with Nogales, Sonora, its sister city across the international border in Mexico. It identifies the Mariposa POE expansion as an opportunity to capture pass-through traffic and improve reinvestment in downtown Nogales. A planning tool for realizing the vision of the community, it identifies growth, redevelopment, and infill areas and provides a policy framework to guide development and solidify the city's position as a center for commerce and international trade. The Growth Areas Element identifies the Mariposa International Commerce and Industry Park—on SR 189 between the international border and I-19—as a modern industrial park for businesses that desire proximity to the international border.

#### ***Unified Nogales/Santa Cruz County Transportation Plan (ADOT 2010a)***

The *Unified Nogales/Santa Cruz County Transportation Plan* indicated that Mariposa POE expansion would result in insufficient capacity and poor traffic operational characteristics on SR 189 from the Mariposa POE to Grand Avenue in 2030 and that SR 189 would need to be widened and improved to handle future traffic (ADOT 2010a). The plan also indicated that the portion of SR 189 linking the Mariposa TI to Frank Reed Road and to Grand Avenue currently operates at or near capacity, and improvements are needed as soon as they can be programmed and funded. The portion of SR 189 from the Mariposa POE to Frank Reed Road already regularly operates at capacity and needs expansion and other improvements to meet Federal and State transportation planning objectives.



**Supporting the CANAMEX and I-11 Corridors**

In addition to the designation of the CANAMEX High Priority Corridor in 1995, Fixing America’s Surface Transportation Act designates I-11 as a future Interstate designated throughout Arizona to the Nevada border. The I-11 and Intermountain West Corridor were documented in the *I-11 and Intermountain West Corridor Study, Corridor Concept Report (CCR)* (ADOT and NDOT 2014a).

The purpose of the I-11 and Intermountain West Corridor Study was to determine the feasibility for a new high-capacity, multimodal transportation corridor and to establish and characterize likely routes for such a corridor. The CCR was the third phase of the study that included establishing the basis and justification for the project and corridor and the foundation for how the corridor would improve economic prosperity. The I-11 and Intermountain West Corridor recommended in the CCR is envisioned to be a continuous high-capacity trade corridor extending from Nogales, Arizona, to Las Vegas, Nevada, and potentially beyond toward Canada as part of the CANAMEX Trade Corridor.

A key study within the overall I-11 study framework—regarding the SR 189 corridor and I-19—was documented in the *Southern Arizona Future Connectivity Study Corridor, Feasibility Assessment Report* (ADOT and NDOT 2014b), completed in July 2014. The recommended alternative for this study involved locating the proposed I-11 corridor to follow existing roadway, rail, pipeline, energy, and information distribution routes from the northern terminus at I-8 and I-10 in Casa Grande, Arizona, south along I-10 to I-19, and along I-19 south to SR 189 and Grand Avenue to the Mariposa and DeConcini POEs (ADOT and NDOT 2014b).

The CCR was undertaken after completion of the *Southern Arizona Future Connectivity Study Corridor, Feasibility Assessment Report*. The CCR identified and located individual projects as discreet individual segments of independent utility (SIUs) to meet the NEPA requirements of logical termini and independent utility. Identifying SIUs allows more efficient implementation through the project development process while supporting the overall need for corridor continuity. As described in the CCR, SIU 1 consisted of developing the “Preferred alignment, corridor plan, and right of way requirements for SR 189; additional study of international freight movement needs at the Nogales Ports of Entry” (ADOT and NDOT 2014b).

Currently, ADOT and FHWA are preparing a Tier 1 environmental impact statement and conducting conceptual engineering that will be structured to select a recommended corridor alignment (approximately 2,000 feet in width) and preferred modal choice to accommodate future traffic needs from Nogales, beginning at the Mariposa TI and extending to Wickenburg, terminating at the US 93 and SR 71 TI, as recommended in the CCR. The project will include conceptual engineering in the form of an alternatives selection report and environmental analysis in a Tier 1 environmental impact statement with the intent to obtain a Record of Decision from FHWA.

**1.3 Purpose and Need for the Project**

The 2040 traffic operations analysis shows that improvements are needed in this corridor to provide for the efficient movement of goods, people, and information on the CANAMEX Corridor; to provide sufficient operational capacity on SR 189 to accommodate the expansion of the Mariposa LPOE and projected levels of traffic for the design year of 2040; and to reduce vehicle conflicts.

The purpose of the proposed action is to improve vehicular access, circulation, mobility, and LOS and to reduce vehicle conflicts on SR 189 from the Mariposa POE to the Mariposa TI and beyond to Grand Avenue by:

- providing sufficient capacity and LOS on SR 189 to accommodate the expansion of the Mariposa POE and future industrial and commercial growth along the SR 189 corridor
- improving intersections along SR 189 to reduce vehicle delays
- improving vehicular demand distribution to and from I-19 by providing additional egress and ingress to prevent overburdening the existing TI on this critical trade route
- reducing vehicle conflicts and improving traveler safety by implementing limited access controls and intersection improvements (traffic signals, widening, eliminating selected driveways, etc.)
- providing access to industrial and commercial land use growth areas in the SR 189 corridor, including the Mariposa International Commerce and Industry Park and Centro Commercial areas

**1.4 Characteristics of the Corridor**

**Land Use**

Industrial development and areas of undeveloped land characterize SR 189 between the LPOE and I-19. Between I-19 and Grand Avenue, SR 189 passes through a commercial area that includes two large shopping centers.



The Mariposa International Commerce/Industry Park area on Industrial Park Drive is a center for customs brokers, freight forwarders, and distribution centers. East of I-19, the land use transitions from industrial to commercial. The segment of SR 189 between I-19 and Grand Avenue is the commercial heart of Nogales, with banks, grocery stores, big-box discount stores, fast-food chains, and other businesses.

### ***Produce Packing and Distribution Centers***

A review of land use and input from the Nogales Fresh Produce Association (Chamberlain et al. 2011) confirmed that about 70 to 80 percent of existing produce packing and distribution capacity is in the Ruby Road or Grand Avenue corridors. The remaining 20 to 30 percent of Nogales' current fresh produce warehousing capacity is in the SR 189 corridor.

### ***Manufactured Goods Distribution Centers***

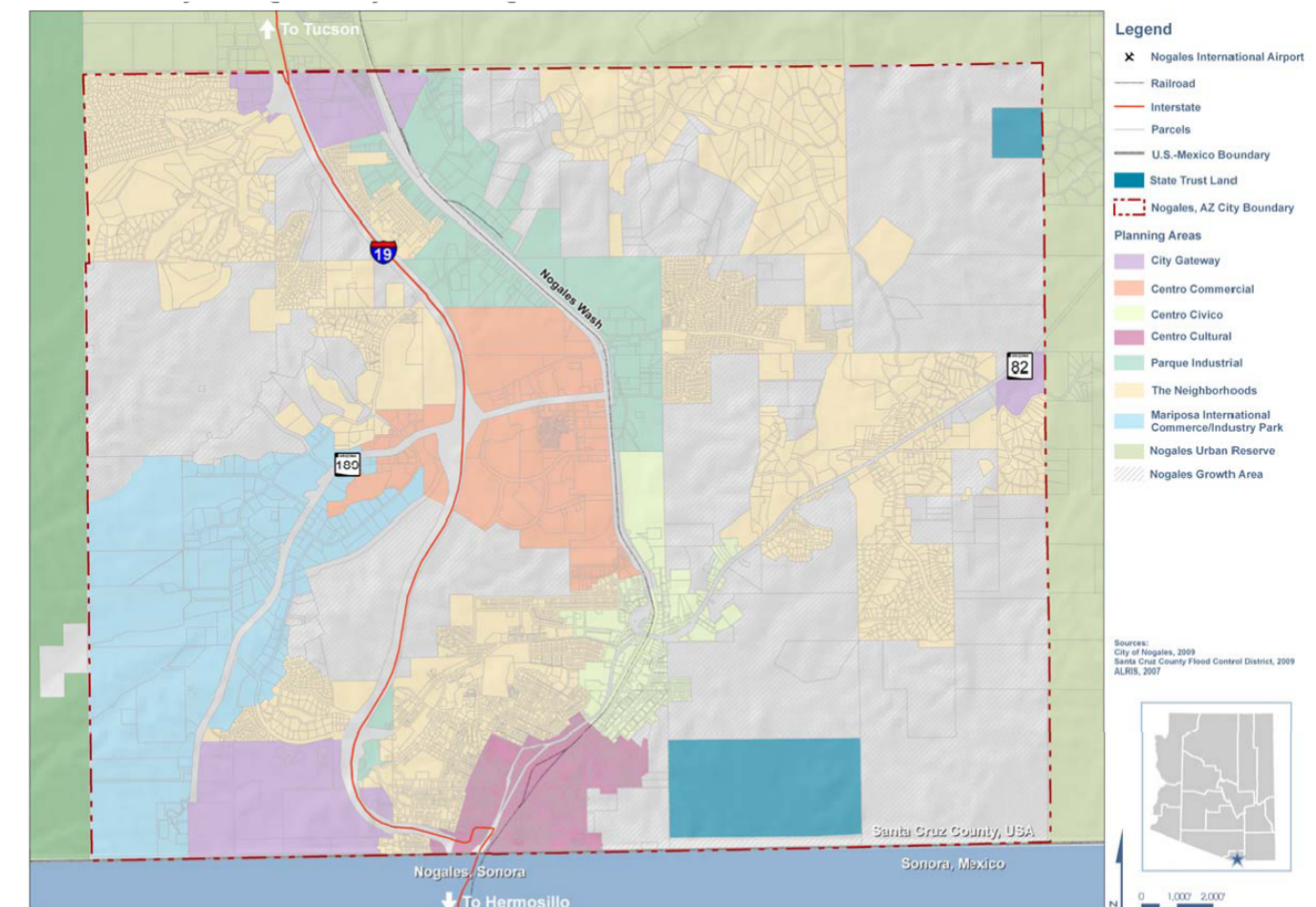
While produce packing and distribution functions are more dispersed, manufacturing is centered along SR 189 between the international border and I-19. Regional offices for such manufacturers as General Electric, MasterLock, and Alcatel-Lucent are also located in the corridor. Logistics services United Parcel Service and FedEx are located in the industrial park. After delivering their loads, truckers may visit packaging, agricultural, and other suppliers located in the SR 189 industrial park area for loads to haul back to Mexico (Chamberlain et al. 2011).

### ***Industrial Growth Areas***

The Ruby Road industrial center is nearly built out. Located between the Santa Cruz River and I-19, there is little additional land available for the development of new warehouses needed to accommodate anticipated growth in the produce trade (Chamberlain et al. 2011). New industrial sites along Grand Avenue are also limited.

The City of Nogales General Plan (The Planning Center 2010) identifies the Mariposa International Commerce/Industry Park as the principal growth area for uses to support trade with Mexico through the LPOE. Shown in Figure 1-2, the Mariposa International Commerce/Industry Park growth area extends north from the international border and west to the Coronado National Forest boundary. The Nogales General Plan describes this area as a dynamic, modern industrial area with opportunities for “additional industry, state-of-the-art packing and distribution centers, assembly/manufacture, technology/innovation, business incubators, corporate campuses, alternative energy generation (solar/wind) and other major employment centers requiring proximity to the international border.” With limited room to grow elsewhere in Nogales, the Mariposa International Commerce/Industry Park is the focus of new industrial and commercial development. Other planning areas in the SR 189 corridor include the Parque Industrial Grand and Centro Commercial.

**Figure 1-2. City of Nogales Growth Areas**



### **Roadway Network**

Functional classification is the process by which jurisdictions group streets and highways according to the character of traffic service they are intended to provide and the degree of land access they allow. Functional classification decisions for large roadway systems or networks that spread across jurisdictional boundaries are made by the jurisdictional agencies and metropolitan planning organizations in a collaborative manner. This activity is usually tied to continuing long-range transportation planning functions.

The manner in which the social and physical characteristics of an area are interrelated provides the framework for defining the functions of roadway facilities. The density and types of land uses, the density of street and highway networks, and the differing nature of travel patterns (for example, travel in rural areas generally involves longer trips) define roadway functions. Thus, urban and rural areas have fundamentally different characteristics relative to travel and the use of roadways. Consequently, different functional classification schemes exist for urban and rural areas.

Four relevant roadway functional classifications/facility types in the project area are defined in the *Unified Nogales Santa Cruz County Transportation Plan 2010*: Rural Interstate (Freeway), Rural Principal Arterial, Rural Minor Arterial, and Rural Major Collector. The following provides a brief discussion of each classification type.

**Rural Interstate (Freeway)**

These facilities are high-speed, high-capacity, divided highways intended to serve regional travel. Access to freeways is fully controlled, with no driveways to abutting properties and no at-grade intersections. Access to intersecting arterial roadways is facilitated by a grade-separated TI. I-19 is the only freeway facility in the project area, and this facility is classified as a Rural Interstate.

**Rural Principal Arterial**

These facilities provide moderate capacity intended to serve regional and subregional circulation needs, while providing limited access to abutting properties and adjacent developments. Access is managed through the spacing of street intersections, driveways, and/or raised medians. On-street parking is prohibited, since this practice impedes traffic flow and reduces facility capacity. SR 189/Mariposa Road and Grand Avenue/B-19 are the only Rural Principal Arterial roadways in the project area.

**Rural Minor Arterial**

This classification of roadway facilities supports moderately long-distance traffic movements within counties and between less densely developed county areas and urban areas. This roadway type facilitates moderate access to abutting land and properties. Access is controlled through frontage roads, raised medians, and the spacing and location of driveways and street intersections. Generally, a raised median or a continuous left-turn lane separates opposing traffic flows. Rural Minor Arterial roadways in the project area include West Target Range Road (between SR 189/Mariposa Road and I-19) and Western Avenue.

**Rural Major Collector**

These facilities support short-distance (that is, less than 2 miles) traffic movements and provide a much higher level of access to abutting properties and adjacent development than do arterials. Given the increased access opportunities, these facilities have lower posted travel speeds, and the capacity of the roadway is reduced. Numerous Rural Major Collector facilities exist in the project area. Those that are particularly relevant, or critical, to this study include Frank Reed Road, Industrial Park Drive, and Industrial Park Avenue.

**Interchanges**

An existing traffic interchange is located at I-19 and SR 189/Mariposa Road. This TI (Mariposa TI) is a standard diamond design with two signalized intersections providing access via on- and off-ramps in both directions of travel. The freeway, I-19, consists of two lanes in each direction, developed to the standard Interstate cross section of 38 feet, providing two 12-foot travel lanes, a 4-foot inside shoulder, and a 10-foot outside shoulder. Single-lane on- and off-ramps expand to two lanes at the intersections with SR 189/Mariposa Road. SR 189/Mariposa Road is an 80-foot-wide, four-lane Rural Principal Arterial highway with a center left-turn lane east and west of its intersection with the I-19 ramps. The cross section of this arterial roadway expands to 130 feet to accommodate left turns at the signal-controlled intersections with I-19 on-ramps.

In the general proximity of the Mariposa TI, access to I-19 is provided at Ruby Road (4.6 miles north) and Western Avenue (3 miles south). Each TI provides access in all directions from a diamond-type configuration. The ramp terminal intersections at the Ruby Road TI are controlled by signals, and the Western Avenue TI is stop sign controlled. Between Ruby and Mariposa Roads, entrance and exit ramps are provided to and from B-19 (2.5 miles north). I-19 passes over Western Avenue and Mariposa Road on grade-separated structures. At Ruby Road, I-19 passes under the crossroad on grade-separated structures. The B-19 exit ramp from I-19 crosses over northbound I-19 on a grade-separated structure.

The nearest major freeway-to-freeway TI is the I-10 and I-19 connection 61 miles north of the Mariposa TI in Tucson.

**Utilities**

Existing utilities within the project area were identified based on previous utility surveys and as- built information obtained from ADOT, the City of Nogales, and private utility companies.

Major utility operators within the project area include the City of Nogales, AT&T, ADOT, CenturyLink, Mediacom, El Paso Natural Gas, and UniSource Energy Services. The major existing utilities located within the project limits are presented in Table 1-2.

**Table 1-2.** Major utilities in the project area

Highway/ Cross street	Location	Utility description
State Route 189	Mariposa LPOE to Target Range Road	City of Nogales 18" sewer; UniSource Energy Service 6" gas line; AT&T underground telephone; UniSource Energy Service overhead power; ADOT culverts
	Target Range Road to Frank Reed Road	City of Nogales 18" sewer; UniSource Energy Service overhead and underground power; City of Nogales 12" and 18" water; AT&T underground telephone; UniSource Energy Service 4" gas line; ADOT culverts
	Frank Reed Road to Mariposa TI	AT&T underground telephone; UniSource Energy Service 4" and 6" gas line; ADOT culverts and storm drains
	Mariposa TI to Grand Avenue	AT&T underground telephone; UniSource Energy Service 4" and 6" gas line; ADOT culverts and storm drains
I-19	Mariposa TI to Frank Reed Road bridge	Three 14" diameter corrugated metal drainage culverts under I-19 just north of Mariposa TI

Several high-voltage electric transmission lines within the project area run parallel to SR 189 and cross SR 189 at five locations. There are multiple underground utility crossings of SR 189. One sewer line crossing is just south of Mariposa Ranch Road, two waterline crossings are west of the Frank Reed Road intersection, one gas line crosses west of the Frank Reed Road intersection, and another gas line crosses between the Mariposa TI and Congress Drive.

A future transmission line project is being proposed within the corridor. The Hunt Nogales transmission project will construct 230- and 138-kilovolt transmission lines in an east-to-west direction which will cross south of La Quinta Road near the Mariposa Canyon Wash. At this time, start of construction has not been set.

Drainage

Stormwater runoff generally flows from southwest to northeast in the study area, with the ultimate outfall being the Mariposa Canyon, Ephraim Canyon, or Nogales Washes. The headwaters for Mariposa Canyon, Ephraim Canyon, and Nogales Washes originate in Mexico. The existing land use within the region is primarily steep desert foothills. However, most land uses near the SR 189 alignment are commercial development. As a result of the current land use, channelized flow is the predominant flow condition, with interspersed overland flow associated with commercial development.

Existing drainage and flood-control features were identified through field visits, as-built plans, and drainage reports on file with the Santa Cruz County Flood Control District and the City of Nogales. Notable existing features include the following:

- Mariposa Canyon flows to the north through the project area and outfalls into the Nogales Wash at approximately Grand Avenue.
- Ephraim Canyon Wash intersects the SR 189 alignment at the international border and outfalls into the Nogales Wash at approximately I-19 and Bejarano Street. Floodwaters originating from Mexico are dispersed through floodgates at the international border crossing.
- Nogales Wash flows to the north and intersects the SR 189 alignment at approximately Grand Avenue. The wash has been channelized as a concrete trapezoidal channel from approximately Washington Street to Detention Road.
- Federal Emergency Management Agency (FEMA) effective floodplains exist along Mariposa Canyon, Ephraim Canyon, and Nogales Washes.
- A large (45 inch by 73 inch) elliptical pipe drains on- and off-site flows along Grand Avenue. The pipe has an ultimate outfall at Mariposa Canyon Wash, just upstream from the confluence with Nogales Wash.
- A 10 foot by 5 foot reinforced concrete box and concrete channel, approximately 400 feet east of the Mariposa TI, drains off-site flows developing along the eastern right-of-way of I-19.
- A 4-foot-wide bottom concrete channel along the northwestern corner of the SR 189/Grand Avenue intersection conveys off-site flows along the western right-of-way limits of Grand Avenue. It ultimately drains to the Mariposa Wash.
- Three 14-foot-diameter corrugated metal pipes (CMPs) convey Mariposa Canyon flows beneath I-19. The northernmost pipe has a concrete-encased 16-inch water main traversing the length of the pipe.
- Mariposa Wash crosses beneath the SR 189 alignment in two separate locations via two 200-ft span concrete girder bridges. Both bridges contain substructure protection in the form of soil cement lifts. Additionally both bridges have riprap and gabion wire mattress features for abutment and fill slope protection.

Right-of-way

Between the Mariposa LPOE and Grand Avenue, the existing right-of-way width along SR 189 is between 200 and 430 feet. In the area around the Mariposa TI, the existing right-of-way width along I-19 is between 350 and 1,000 feet. The properties adjacent to SR 189 are mostly privately owned.

Structures

Two existing bridges are in the project area: Mariposa Canyon Bridge No. 1 and Mariposa Canyon Bridge No. 2. Both bridges were built in 1975. In 1994, Mariposa Canyon Bridge No. 1 was widened to the outside on the northbound side to a total width of 83 feet, 2 inches. Mariposa Canyon Bridge No. 2 was widened to the outside on both sides to a total width of 82 feet.

The original Bridge No. 1 is a three-span, continuous cast-in-place (CIP) concrete box girder structure. The bridge has span lengths of 57 feet, 6 inches; 75 feet; and 57 feet, 6 inches, with girders spaced at 6 feet, 8 inches on center. The bridge has a skew of 30 degrees. The abutment system consists of stub abutments supported on a single row of steel H-piles at both abutments. The piers consist of 3-foot, 6-inch-diameter concrete columns with concrete caps supported on steel H-piles

The original Bridge No. 2 is a three-span, continuous CIP concrete box girder structure. The bridge has span lengths of 61 feet, 80 feet, and 61 feet, with girder web spaced at 8 feet on center. The bridge has a skew of 47 degree and 30 seconds. The abutment system consists of a stub abutment supported on a single row of steel H-piles at abutment 1 and a full-height wall abutment supported on two rows of steel H-piles at abutment 2. The pier consists of a 3-foot, 6-inch-diameter concrete column with a concrete cap supported on steel H-piles. HP 10x42 steel piles were used for both abutment and pier foundation.

The widened Bridge No. 1 span configuration, skew, and superstructure elements match the original bridge. A similar abutment system was used to support the southeastern and northeastern wing walls, with the exception of 3-foot-diameter drilled shafts. HP 12x53 steel piles were used for both abutments. A pier system consisting of 3-foot, 6 inch-diameter columns supported on 4-foot-diameter drilled shafts was used for the widened portion of bridge.

The widened Bridge No. 2 span configuration, skew, and superstructure elements match the original bridge. A similar abutment system was used, except that two 3-foot-diameter drilled shafts were used to support the southwestern wing wall and HP 12x53 steel piles were used for both abutments. A pier system consisting of a 3-foot, 6-inch-diameter column supported on a 4-foot-diameter drilled shaft was used for the widened portion of the bridge.

Table 1-3 summarizes existing bridges in the project area.



Table 1-3. Existing bridges

Bridge	Structure no.	Superstructure type	Spans	Length	Width	Roadway width (one direction)
Mariposa Canyon Bridge No. 1	1796	CIP box girder	3	191 feet, 4 inches	83 feet, 2 inches	40 feet, 0 inches
Mariposa Canyon Bridge No. 2	1797	CIP box girder	3	206 feet, 8 ½ inches	82 feet, 0 inches	34 feet, 0 inches

Signs, Lights, and Freeway Management System Facilities

Existing Signs

Guide signs along Mariposa Road provide information about the border crossing. The southbound speed limit drops from 45 miles per hour (mph) to 25 mph to slow traffic as it approaches the border crossing. Transverse rumble strips and signs slow drivers and inform them as they are approaching the border crossing.

Guide signs near the Mariposa TI guide drivers to I-19 north and I-19 south ramps.

Existing Traffic Signals

Traffic signals exist at the following locations along SR 189/Mariposa Road:

- La Quinta Road
- Frank Reed Road
- Mariposa TI (on- and off-ramp intersections)
- Congress Drive
- Mastick Way
- Grand Avenue

Existing Lighting

Currently, the SR 189 corridor has intersection lighting at signalized intersections, with luminaire arms mounted on signal poles. Partial TI safety lighting is at the Mariposa TI. This includes ramp lighting at the northbound and southbound on- and off-ramps as they merge and diverge from I-19. Intersection lighting exists at the Mariposa TI signalized intersections.

Existing Freeway Management System Facilities

No freeway management system (FMS) elements and no framework facilities (dynamic message signs [DMS], closed-circuit television [CCTV] cameras, fiber or wireless network) currently exist on SR 189. Five ADOT traffic-count stations exist along SR 189. Table 1-4 summarizes the count station locations.

Table 1-4. Existing traffic count stations

Station number	Begin	End	Traffic count station milepost
1	International border and LPOE – Nogales	Target Range Road	0.6
2	Target Range Road	Industrial Park Drive (south)	1.3
3	Industrial Park Drive (south)	Frank Reed Road	2.15
4	Frank Reed Road	I-19 (Exit 4)/Mariposa Road	2.75
5	I-19 (Exit 4)/Mariposa Road	I-19 Nogales	3.11

Geotechnical Conditions

The following subsections discuss geologic and geotechnical conditions and existing pavement sections within the study corridor. The discussions are based on review of available data.

Topography

The study corridor traverses the eastern portion of a relatively broad alluvial valley that is bisected by southwest-to-north-northeast-flowing major drainages, including Mariposa Canyon and Ephraim Canyon Wash, both tributaries to Nogales Wash. The southern portion of the corridor traverses an alluvial fan that extends from the mountains to the east/southeast, toward Mariposa Canyon Wash to the northwest. Mariposa Wash is the principal drainage feature of the site area, originates in Sonora, Mexico, and flows generally to the northeast (SHB 1992). SR 189 crosses Mariposa Canyon at two locations between I-19 and the U.S.-Mexico border before turning east toward Nogales Wash. In general, the terrain along the study corridor is predominantly hilly and rolling, representative of the ridges and drainages of the dissected alluvial fan topography.

Regional and Local Geology

The study corridor is within the upper end of the Upper Santa Cruz River Basin in the southern portion of the Basin and Range physiographic province of the southwestern United States (Fenneman 1931; SHB 1992). The Basin and Range province topography is the result of tectonic extension in the middle and late Cenozoic period (15 to 17 million years before present), and is characterized by a series of parallel and elongated northwest-southeast-trending rugged mountain ranges separated by intervening valleys (SHB 1992). The mountain ranges represent uplifted structural blocks, and the intervening valleys are down-dropped basins. The intervening valley basins are partially filled-in with Tertiary- to Quaternary-Age sedimentary and volcanic deposits, creating the present landforms.

Information regarding the geologic units within the study corridor was obtained from the Arizona Department of Environmental Quality (ADEQ) (2009), SHB (1992a), and Simons (1974). Geologic units exposed within the study corridor consist of Quaternary-Age alluvium (referred to as the Younger Alluvium), Quaternary- to Tertiary-Age alluvium (Older Alluvium), and late Tertiary-Age Nogales Formation rock, as described and mapped by Simons (1974). The Older Alluvium overlies the Nogales Formation rock along the eastern edge of the basin. Based on review of the geologic map and geologic cross sections presented by Simons (1974), the geologic units in order



of decreasing areal extent are Older Alluvium in the dissected alluvial fan areas bordering the major washes, Younger Alluvium in washes and stream channels, and the Nogales Formation rock unit (lower member).

The Younger Alluvium is composed of unconsolidated gravel, sand, and silt in stream channels; it ranges from a few feet thick to about 100 feet thick. The Older Alluvium is an alluvial fan deposit and is slightly to moderately consolidated, is indicated by Simons (1974) as iron oxide-cemented, and it unconformably overlies the lower member of the Nogales Formation in the corridor. The Older Alluvium consists of interbedded cobbles, gravel, sand, silt, and clay; it typically is described as clayey to silty gravel and sand with some cobbles and clayey sand lenses. The Older Alluvium is up to about 600 feet thick. The oldest and most consolidated section of Older Alluvium is exposed on the eastern side of the basin and overlies the Nogales Formation. This section of Older Alluvium is strongly cemented and hard, locally faulted with tilted bedding, and is rocklike. Exposures of the strongly cemented Older Alluvium typically form near-vertical cliffs. To the west, the exposures of the Older Alluvium are less cemented, softer, and not faulted. The Nogales Formatin consists of interbedded sandstone, claystone/mudstone, conglomerate, fanglomerate- and silica-rich tuffs, and is exposed in an existing cut near the eastern end of the project area, about ¼ mile west of Grand Avenue/B-19. The material in this cut is indicated to consist of sandstone and claystone (Speedie and Associates 1988).

**Groundwater**

Information regarding depth to groundwater within the study corridor was obtained from the Arizona Department of Water Resources (ADWR) groundwater site inventory (GWSI) database (ADWR 2015) and from ADEQ (2009). According to ADEQ, three groundwater aquifers in the Nogales area are used for municipal, domestic, and agricultural water supplies. These aquifers include the Younger Alluvium, the Older Alluvium, and the Nogales Formation. The Older Alluvium and Nogales Formation are understood to not have been extensively developed for water supply purposes. The Younger Alluvial aquifer is the most productive and is present along the major washes and riverbeds in the Nogales area. The regional groundwater flow direction is reported to be to the north-northwest (ADEQ 2009), which is parallel to the general surface water flow direction of Nogales Wash. Depth to groundwater in the Younger Alluvium (within major washes) was reported by ADEQ to range from near the ground surface to 35 feet below ground surface (bgs) (ADEQ 2009). Groundwater was encountered during the 1992 geotechnical investigation at depths of 21 to 29 feet bgs (Bridge No. 1) and 15 feet bgs (Bridge No. 2) within Mariposa Canyon, and at 14 to 16 feet bgs at the Mariposa TI overpass bridges.

Two ADWR GWSI index wells contained in the ADWR database are within the approximate study corridor limits. ADWR GWSI index wells are groundwater wells monitored on a regular basis (generally on an annual basis). The ADWR database provides historical hydrographs (depth/elevation of the groundwater level versus time) for these index wells. Statistics for the two wells are as follows:

*Well Registry ID 571751*

- Well location: about 1.3 miles west of the Mariposa TI
- Well type/use: environmental monitoring
- Well depth: 475 feet

- Wellhead elevation: 3,827 feet above mean sea level (amsl)
- Depth to groundwater level: 264.9 feet (8/11/2015)

*Well Registry ID 603434*

- Well location: about 0.3 mile southwest of the I-19/Western Avenue TI
- Well type/use: public water supply
- Well depth: 500 feet
- Wellhead elevation: 3,960 feet amsl
- Depth to groundwater: 204.6 feet (1/15/2015)

These reported depths to groundwater are expected to represent the static groundwater table at the well locations, since it is likely that the wells were permitted to recover before sounding the depth to groundwater.

**Land Subsidence and Earth Fissuring**

Land subsidence in the southwestern and western United States has occurred as a result of long-term groundwater withdrawal and overdraft. Associated with the land subsidence, earth fissures and potential earth fissure features have been identified in Arizona since the late 1980s. Earth fissures are tension cracks that form in deep alluvium-filled basins in response to the land subsidence. The fissures occur primarily at the alluvial basin edges in the vicinity of mountains and in areas where there are significant variations in the basin alluvium thickness over relatively short distances, such as above subsurface bedrock ridges, pinnacles, or knobs. Earth fissures commonly parallel nearby mountain fronts or buried bedrock highs and, therefore, the fissures often bisect surface drainage features.

Interactive online maps promulgated by ADWR and the Arizona Geological Survey (AZGS) indicate areas of land subsidence and identified or potential earth fissures within Arizona (ADWR 2016; AZGS 2016). A review of these maps indicates that neither active land subsidence areas nor earth fissures are within the study corridor.

**Engineering Seismology and Local Faulting**

Seismic hazard information for the study corridor was obtained from the U.S. Geological Survey (USGS) (2006). Relative to seismicity of the area, the study corridor is in the Sonoran Desert subprovince of the Basin and Range physiographic province, which is characterized by low, inclined, gently sloping, and deeply embayed (sinuous) mountain fronts indicative of inactive faults and long-term tectonic stability. No active Quaternary-Age faults are within the study corridor. Nearby Quaternary-Age faults outside the corridor include the Santa Rita Fault Zone and the Huachuca Fault Zone, described below:

**The Santa Rita Fault Zone**, about 20 to 30 miles south-southeast of Tucson and 15 miles north of Nogales (to the approximate nearest point of the fault zone), is a high-angle normal fault that trends northeast and is about 52 kilometers (32 miles) long. Estimated total displacement across the fault zone is about 2 to 3.5 meters (6.6 to 11.5 feet). Detailed surface geologic mapping, fault-scarp analysis, and trenching indicate that two fault rupture

events have occurred in the past 200,000 to 300,000 years. The youngest rupture event likely occurred about 60,000 to 100,000 years before present. Estimated slip-rate along the fault is less than 0.2 millimeters/year.

**The Huachuca Fault Zone**, about 43 miles east-northeast of Nogales, is a normal fault that trends north and is about 25 kilometers (15.5 miles) long. Estimated total vertical displacement across the fault zone is about 2 to 3 meters (6.5 to 10 feet). Surface geologic mapping and fault-scarp analysis indicate that one fault rupture event occurred in the past 100,000 to 750,000 years. Estimated slip-rate along the fault is less than 0.2 millimeters/year.

Based on the available information, neither the Santa Rita Fault Zone nor the Huachuca Fault Zone represents a seismic hazard to the SR 189 study corridor.

**Estimated Earthquake Effects**

Peak ground acceleration values for the study corridor were obtained from the USGS Seismic Design Maps tool (USGS 2014). An interpolated, probabilistic ground-motion value of the acceleration coefficient ( $A_S$ ) for Site Class D (stiff soil conditions) for the indicated probability of exceedance was obtained for the approximate midpoint of the study corridor by latitude and longitude; it is presented in Table 1-5. The American Association of State Highway and Transportation Officials (AASHTO) 2009 Guide Specifications for LRFD Seismic Bridge Design were used as the basis for the peak ground acceleration and acceleration coefficient.

**Table 1-5.** Probabilistic ground motion in %g<sup>a</sup>, stiff soil (Site Class D) values

Location	Location (latitude/longitude in degrees)	$A_S$ 2% PE in 50 years (RP = 2,475 years) <sup>(a-e)</sup>
Approximate midpoint of study corridor	31.35794 -110.9578	0.092 g

Source: USGS (2014), based on AASHTO (2009)  
<sup>a</sup> percent (%) of gravity  
<sup>b</sup>  $A_S$  – acceleration coefficient for Site Class D  
<sup>c</sup> PE – probability of exceedance  
<sup>d</sup> RP – return period  
<sup>e</sup>  $A_S$  value is for an assumed Site Class D “stiff soil” site with shear wave velocity of between 600 and 1,200 feet/second in the top 100 feet of the soil profile.

**Liquefaction Potential**

The approximate depth to the groundwater table, based on limited available ADWR well data (two wells), is about 200 to 260 feet below the existing ground surface. As noted above, depth to groundwater in the Younger Alluvium (major washes) was reported by ADEQ (2009) to be much shallower, ranging from near the ground surface to 35 feet bgs, and groundwater was encountered at depths of 12 to 29 feet bgs at bridge locations at the time of the 1992 geotechnical investigation. Several available construction and as-built plans and geotechnical reports included foundation data and boring logs for the bridge sites. Standard penetration test blow counts in the form of field N-values were included on the boring logs. Inspection of these data for the upper 50 feet of existing site soils suggests that there may be isolated silty sand and clayey sand layers about 5 feet in thickness within about 25 to 35 feet of existing grade; these may be of sufficiently low density to be susceptible to seismically-induced

liquefaction. Some of these layers appear to contain sufficient clay fines such that susceptibility to liquefaction likely is low. Final geotechnical investigation for the SR 189 improvements should include determination of depth to groundwater and an evaluation of potential for liquefaction.

**Subsurface Geotechnical Profile and Bridge Foundation Conditions**

Information on the subsurface geotechnical profile and bridge foundations was obtained from available as-built and construction plans and geotechnical reports for the study corridor (ADOT 1969, 1971, 1994; SHB 1992a, 1992b, 1992c, 1992d).

Near-surface native soils (upper 5 feet bgs) along the existing roadway consist predominately of clayey sands with some to considerable gravel content. These soils are nonplastic to medium in plasticity, weakly to moderately cemented, and firm to hard. Existing roadway embankment fills consist of clayey sand similar to the native soils, since excavated soils from cut sections likely were used to construct the fills. Existing fill soils are nonplastic to medium in plasticity and moderately firm to hard, except for localized soft-to-firm zones. Between Bridge No. 1 (southernmost bridge over Mariposa Canyon) and the I-19 overpass, a layer of native soils consisting of silty to sand clays and sandy silt was encountered in several borings (SHB 1992a). This layer ranged from 2.5 to 6 feet thick, and was very soft to very firm. Construction plans for the widening of SR 189 (ADOT 1994) indicate that overexcavation of unsuitable soils to a depth of 2.5 to 3 feet and replacement with suitable subgrade material was specified for the full width of SR 189 for about 1,850 feet of roadway within the limits of Stations 49+00 to 120+00.

The geotechnical profile at the bridge sites is described as follows:

**SR 189, Mariposa Canyon Wash Bridge No. 1:** Stratified layers of silty sand, clayey sand, sand, silt and sandy clay, very soft to firm, extend to depths of 10 to 15 feet bgs. Very firm to hard silty gravel was encountered from depths of 10 to 30 feet in two of the bridge borings; silty sand, soft to very firm with a trace to some gravel and cobbles, was encountered from depths of 10 to 40 feet in one boring. Underlying the silty sand and gravel, clayey sand (moderately firm to hard and weakly to moderately cemented) with some to considerable gravel and cobbles was encountered at depths of 15 to 30 feet bgs and extended to the full depth of investigation of 70 feet bgs. The bridge widening is supported on driven steel H-piles at the abutments and drilled shafts bearing in the clayey sand at the piers and wing walls.

**SR 189, Mariposa Canyon Wash Bridge No. 2:** Clayey sand and sandy clay extended from the ground surface to a depth of 30 feet bgs. Underlying these soils, clayey sand (moderately firm to hard) with some to considerable gravel was encountered at a depth of 30 feet and extended to the full depth of investigation of 70 feet. The bridge widening is supported on steel H-piles at the abutments and drilled shafts at the piers and wing walls. The drilled shafts bear in the clayey sand layer.

**Mariposa TI overpass bridges northbound and southbound:** This area is characterized by stratified layers of gravelly sand, clayey sand, clayey silt, and silty to sandy clay, very soft to soft (clays) or firm to hard (sands and silts), extended to depths of 20 to 26 feet bgs. Sand with a trace of silt and some to considerable gravel and cobbles, and clayey sand and gravel with some to considerable cobbles extended from depths of 20 to 26 feet

bgs to the full depth of investigation of 70 feet. The overpass bridges are supported on drilled shafts bearing in the sand or clayey sand and gravel layers.

Rock (Nogales Formation) was not encountered at the SR 189 bridge sites. However, the existing bridges at the I-19/Western Avenue TI are supported on spread footings bearing on Nogales Formation sedimentary rock composed of Tertiary-Age lacustrine deposits including tuffaceous conglomerate, sandstone, and tuffite (a mixture of volcanic and sedimentary materials). The top of the Nogales Formation rock at I-19/Western Avenue was encountered at depths of 20 to 25 feet bgs.

***Existing Pavement Sections***

Based on available as-built plans, pavement history data, and materials design reports provided by ADOT Materials – Pavement (ADOT 2010, 2011, 2013, 2016), the existing SR 189 pavement structural sections consist of the elements presented in Table 1-6.

Table 1-6. Pavement construction history

Project no.	TRACS no.	Year	Direction	MP start	MP end	Lane no.	Select material (inches)	Aggregate subbase (inches)	Aggregate base (inches)	Asphaltic concrete (AC) (inches)	AC mill and overlay (inches)	Portland cement concrete (PCCP) plain jointed (inches)	Asphaltic concrete friction course (ACFC) (inches)	Remarks
F023-1-3	PMS00494	1976	NB and SB	0.54	2.31	1	12.0		6.0	3.5			0.5	
	PMS00639	1976	NB and SB	1.00	2.00	1	6.0			10.0			0.5	
F032-1-503	H0489 04C	1991	NB and SB	3.00	3.38	1					2.0			Understood to be AC overlay only
			NB and SB	3.00	3.38	2	10.0		6.0	5.0				
			NB and SB	3.38	3.75	1		15.0	6.0	8.0				
			NB and SB	3.38	3.75	2		15.0	6.0	8.0				
DE-032-1(5)	H2974 01C	1996	NB and SB	2.55	2.88	1			9.5	8.0			0.5	
			NB and SB	2.55	2.88	2			9.5	8.0			0.5	
			NB	2.88	2.98	1				3.0		10.0		AC base material for PCCP
			NB	2.88	2.98	2				3.0		10.0		AC base material for PCCP
CBI-189-A-(002)X	H5282 03C	2004	NB	0.36	0.45	2			4.0	8.0			0.5	
			NB	0.47	0.66	2			4.0	8.0			0.5	
CBI-189-A(006)X	H5282 06C	2006	NB	0.15	0.22	3			8.0	8.0				
			NB	0.22	0.28	3			4.0			12.0		May consist of doweled PCCP
			NB	0.28	0.3	3			8.0	8.0				
STP-189-A(202)A	H8098 01C	2011	NB and SB	0.73	2.44	1					3.0		0.5	Pavement rehabilitation project – milled 3 to 3.5 inches and replaced with AC overlay
			NB and SB	0.73	2.44	2					3.0		0.5	
			NB and SB	2.44	2.70	1					3.0			
			NB and SB	2.44	2.70	2					3.0			
			NB and SB	2.70	3.05	1					3.0			
			NB and SB	2.70	3.05	2					3.0			
CBI-189-A(203)A	H8200 01C	2012	NB and SB	0.34	0.66	1			4.0			12.5		Widening project – full width
			NB and SB	0.34	0.66	2			4.0			12.5		Widening project – full width
			SB	0.66	0.88	1				5.0				Widening project – AC overlay
			SB	0.66	0.88	2				5.0				Widening project – AC overlay
			NB	0.66	0.88	1			6.0	10.0			0.5	Widening project – travel lanes and shoulders
			NB	0.66	0.88	2			6.0	10.0			0.5	Widening project – travel lanes and shoulders
189-A(204)S	H8660 01C	2013	NB and SB	2.80	3.05	---				3.0		10.0		Taper section widening for dual left-turn lanes east and west of I-19 overpass bridges

Notes: NB = northbound, SB = southbound



2.0 Traffic Conditions

The following sections provide information related to conditions that exist in the base year and the design year of evaluation for the proposed action.

2.1 Existing Conditions

Existing Year 2011 Traffic Data

Information relating to the operational and geometric characteristics of the existing Year 2011 roadway system, particularly SR 189/Mariposa Road, was gathered through a variety of methods. Traffic counts available from the Multimodal Planning Division of ADOT were obtained and reviewed. Additional counts were conducted in March 2011 to establish traffic levels. These counts included 24-hour tube counts to determine traffic volumes on selected segments of SR 189. Both signalized and unsignalized intersections were monitored, and traffic levels and turning movements were recorded. In addition, a moving-car traffic survey was conducted to record and verify travel times through the corridor in both directions during the a.m. peak, midday, and p.m. peak periods.

Forecast Year 2014 Traffic Volumes

In December 2011 a *Draft Forecast Analysis Report* was prepared for the SR 189 project area. The report summarized the methodology for forecasting interim-year (2014) and long-range (2040) traffic volumes for use in preparation of the DCR and EA for SR 189 from the international border to Grand Avenue. As described in the *Draft Forecast Analysis Report*, traffic volumes on SR 189 consist of two components: local traffic and Mariposa LPOE traffic. These two components of traffic were forecast separately and then combined to derive the total volume of traffic anticipated in the corridor for both Years 2014 and 2040.

Comparison of Forecast Year 2014 Traffic Volumes with Current Year 2015 Conditions

In March 2015, updated counts were conducted to confirm the validity of the 2014 traffic forecasts and the associated methodology used to forecast both 2014 and 2040 traffic volumes. Table 2-7 provides a comparison of Year 2014 daily traffic volume forecasts with those observed in association with the March 2015 data collection for the two selected locations. As indicated in the table, observed traffic activity appears consistent with the forecast data in both locations.

Based on the results of these comparisons, it appears that the methodology used to forecast Year 2014 and Year 2040 traffic data seems reasonable. Therefore, it is recommended that future traffic analysis associated with the development of alternatives for the DCR continue to be based on previously forecasts volumes for Year 2040, and that additional updated counts are not required at this time.

Average Daily Traffic

Existing Year 2011 24-hour average daily traffic (ADT) data for the project area were collected specifically for this study by the consultant in March 2011 at nine locations over a period of 1 week. Table 2-1 summarizes traffic volumes recorded at the nine locations.

Turning movement counts also were conducted at seven signalized intersections, eight unsignalized intersections, and six unsignalized driveways. The counts were conducted during three separate 3-hour periods during the day: 7 a.m. to 10 a.m., 11 a.m. to 2 p.m., and 4 p.m. to 7 p.m. The moving car traffic survey of the corridor also was accomplished during these three periods to record travel time and traffic conditions.

Table 2-1. March 2011 traffic volumes by roadway segment

Roadway	Segment (count location)	ADT		AM peak	PM peak
		All traffic	% trucks		
State Route 189/ Mariposa Road	South of Camino de la Paloma	8,456	24.4	606	720
	West Target Range Road to Mariposa Ranch Road	8,891	21.2	663	724
	Mariposa Ranch Road to Frank Reed Road/North Industrial Park Drive	10,414	19.3	772	883
	Frank Reed Road/North Industrial Park Drive and Interstate 19	18,708	15.6	1,443	1,587
	Interstate 19 to Congress Drive	19,782	9.4	1,518	1,604
	Congress Drive to Mastick Way	20,809	8.5	1,661	1,734
	Mastick Way to Grand Avenue/B-19 <sup>a</sup>	18,152	8.2	1,498	1,578
West Target Range Road	West of Interstate 19	4,724	11.4	385	392
West Western Avenue	East of Interstate 19	5,588	0.8	433	447

Source: Roadway Segment Tube Counts, Manifest\_10108, Traffic Research & Analysis, Inc., March 25, 2011  
<sup>a</sup> Total count estimated because of compromise of the count tube in the eastbound direction.

Tables 2-2 and 2-3 summarize the travel time survey along SR 189/Mariposa Road (northbound and southbound, respectively) between Freeport Drive at the Mariposa LPOE and Grand Avenue/B-19. Travel time runs revealed a dominant travel pattern in the corridor. Overall, travel time during the a.m. peak period is greatest in the northbound direction from the Mariposa LPOE. The typical or average northbound trip from Freeport Drive to Grand Avenue/B-19 took 7 minutes; the southbound trip was clocked at 6 minutes. This overall trend is reversed in the p.m. peak period, when travel times in the southbound direction are the greatest and longer than during the a.m. peak period. The typical or average southbound trip from Grand Avenue/B-19 to Freeport Drive took 8.6 minutes, whereas the northbound trip was only slightly worse than the morning peak at 7.3 minutes.

Table 2-2. Northbound SR 189 travel times

Segment			Average travel time (seconds)		
No.	From	To	AM peak 7 a.m.–9:35 a.m.	Midday peak 11 a.m.–1:10 p.m.	PM peak 4:22 p.m.–6:40 p.m.
1	Freeport Drive	West Target Range Road	72.5	75.1	91.1
2	West Target Range Road	Mariposa Ranch Road	40.8	41.3	36.8
3	Mariposa Ranch Road	West Industrial Park Drive	13.9	14.4	14.8
4	West Industrial Park Drive	Loma Mariposa Road	25.0	21.6	23.8
5	Loma Mariposa Road	Mariposa Park Plaza	16.1	18.3	18.3
6	Mariposa Park Plaza	North Frank Reed Road/North Industrial Park Drive	49.6	32.4	31.9
7	North Frank Reed Road/North Industrial Park Drive	I-19 SB ramps	46.8	54.2	43.0
8	I-19 SB ramps	I-19 NB ramps	12.1	13.5	19.3
9	I-19 NB ramps	North Congress Drive	26.3	42.6	31.2
10	North Congress Drive	North Mastick Way	33.9	56.2	41.0
11	North Mastick Way	North Grand Avenue/ B-19	80.1	91.7	84.1
Average total travel time (seconds):			417.1	461.2	435.4
Average total travel time (minutes):			7.0	7.7	7.3
Average total travel time (seconds): I-19 SB ramps to Grand Avenue/B-19 business			152.4	204.1	175.6
Average total travel time (minutes): I-19 SB ramps to Grand Avenue/B-19			2.5	3.4	2.9
Average total travel time (seconds): Freeport Drive to I-19 SB ramps			264.6	257.1	259.8
Average total travel time (minutes): Freeport Drive to I-19 SB ramps			4.4	4.3	4.3

Source: Moving Car Traffic Survey, Wilson & Company, March 15–16, 2011  
Notes: NB = northbound, SB = southbound

Table 2-3. Southbound SR 189 travel times

Segment			Average travel time (seconds)		
No.	From	To	AM peak 7 a.m.–9:25 a.m.	Midday peak 11:11 a.m.–1:57 p.m.	PM peak 4:50 p.m.–6:50 p.m.
11	North Grand Avenue/B-19	North Mastick Way	27.6	31.4	38.7
10	North Mastick Way	North Congress Drive	41.4	76.1	67.7
9	North Congress Drive	I-19 NB ramps	39.9	55.1	40.0
8	I-19 NB ramps	I-19 SB ramps	13.2	13.6	11.6
7	I-19 SB ramps	North Frank Reed Road/North Industrial Park Drive	41.4	38.9	33.4
6	North Frank Reed Road/North Industrial Park Drive	Mariposa Park Plaza	18.8	17.2	19.1
5	Mariposa Park Plaza	Loma Mariposa Road	16.9	44.0	19.0
4	Loma Mariposa Road	West Industrial Park Drive	23.4	22.8	27.1
3	West Industrial Park Drive	Mariposa Ranch Road	26.6	27.5	40.7
2	Mariposa Ranch Road	West Target Range Road	44.2	47.8	60.7
1	West Target Range Road	Freeport Drive	66.1	66.1	157.8
Average total travel time (seconds):			359.4	440.6	515.9
Average total travel time (minutes):			6.0	7.3	8.6
Average total travel time (seconds): Grand Avenue/B-19 to I-19 SB ramps			122.0	176.2	158.1
Average total travel time (minutes): Grand Avenue/B-19 to I-19 SB ramps			2.0	2.9	2.6
Average total travel time (seconds): I-19 SB ramps to Freeport Drive			237.4	264.3	357.8
Average total travel time (minutes): I-19 SB ramps to Freeport Drive			4.0	4.4	6.0

Source: Moving Car Traffic Survey, Wilson & Company, March 15–16, 2011  
Notes: NB = northbound, SB = southbound

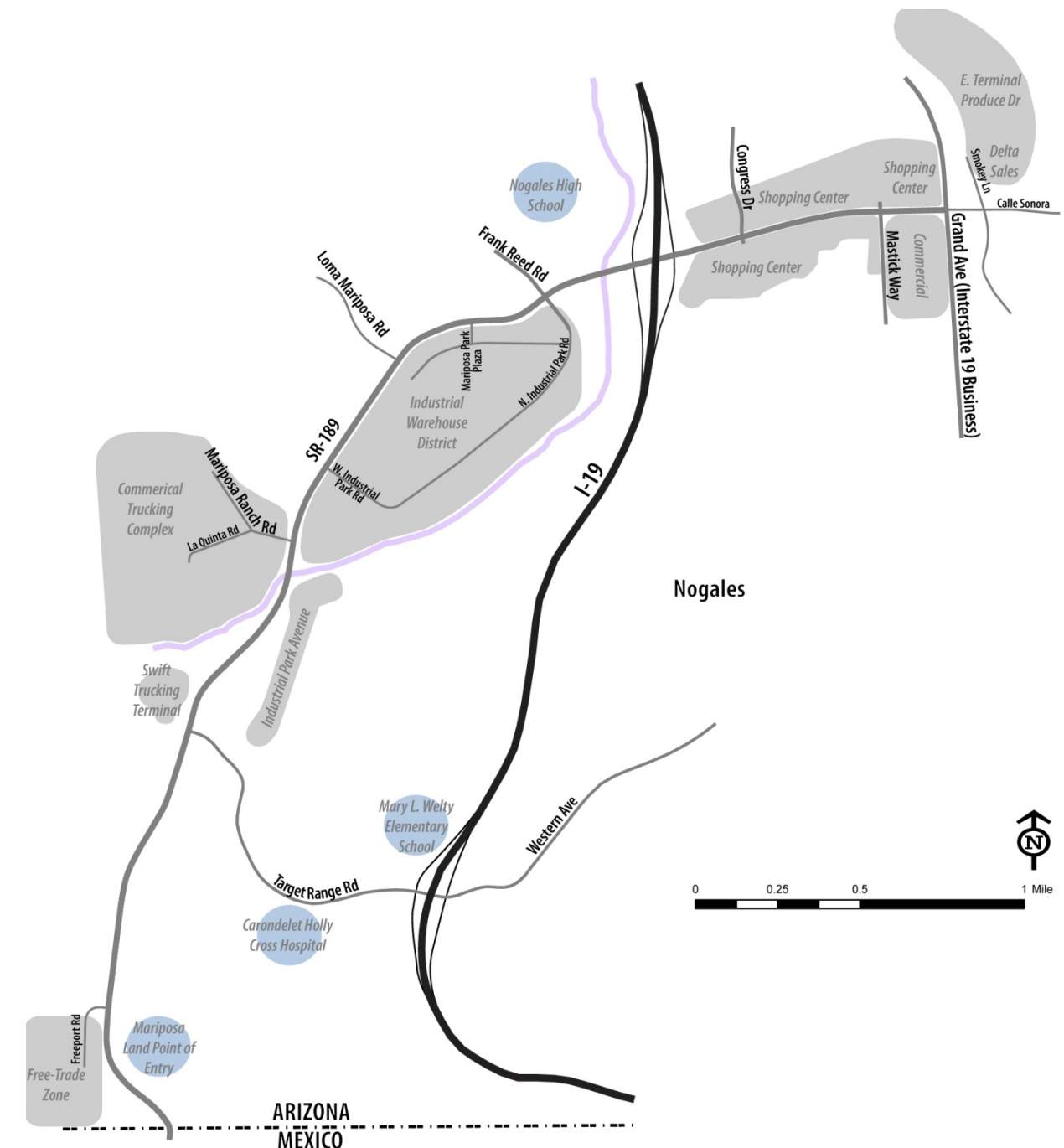
Travel times north of I-19 vary considerably throughout the day. The typical or average trip from I-19 to Grand Avenue/B-19 during the a.m. peak period takes 2.5 minutes and less than 3 minutes during the p.m. peak period. Travel in the opposite direction—that is, Grand Avenue/B-19 to I-19—takes about one-half minute less time during both the a.m. and p.m. peak periods. Intensive commercial activity in this portion of the corridor results in the midday trips requiring more travel time in both directions than during either the a.m. or p.m. peak periods

### Major Traffic Generators

Ten major activity centers exist along the SR 189 corridor between the U.S.-Mexico border and Smokey Lane, east of Grand Avenue/B-19. Figure 2-1 shows the generalized location of these activity centers.

- Produce warehouses
  - Delta Sales – East of Grand Avenue/B-19 on Smokey Lane
  - East Terminal Produce Drive – One-quarter mile north of SR 189, east of Grand Avenue/B-19
- Commercial node – Southwestern and northwestern quadrants of the intersection of SR 189 with Grand Avenue/B-19
- Nogales High School – North Frank Reed Road
- Nogales Industrial Park – Southern side of SR 189 between North Frank Reed Road/North Industrial Park Drive
- Mariposa Ranch Road Commercial Trucking Complex – Northern side of SR 189
- Swift Trucking Terminal – Western side of SR 189 at North Target Range Road
- Freeport Drive Duty Free Zone – West of SR 189 directly north of the U.S.-Mexico border
- Nogales Point of Entry – East of SR 189/Mariposa Road approximately 1,000 feet north of the U.S.-Mexico border
- Mary L. Welty Elementary School – Northwestern quadrant of the I-19/West Target Range Road TI
- Carondelet Holy Cross Hospital – Southern side of West Target Range Road between SR 189 and I-19

**Figure 2-1.** Major activity centers





Figures 2-2, 2-3, and 2-4 show general schematics of the lane geometry and traffic control at the seven signalized and six unsignalized roadway intersections, as well as the six unsignalized driveways for which traffic counts were conducted. Figures 2-5, 2-6, and 2-7 show the peak hour traffic volumes reported from the 2011 turning movement counts at each location. A Union Pacific Railroad (UPRR) track, directly east of Grand Avenue/B-19, is crossed by Calle Sonora, which connects with SR 189 from the east. Data collection and subsequent analyses conducted for this study do not account for train activity on this track, nor do they account for interruptions to traffic at either intersection affected.

**Level of Service Analysis**

Transportation engineers and planners commonly use a rating system to measure and describe the operational status of roadway segments and interchanges/intersections constituting a local roadway network. This rating system is referred to as level of service (LOS), which yields a measurement of the performance of network components.

***Level of Service Methodology***

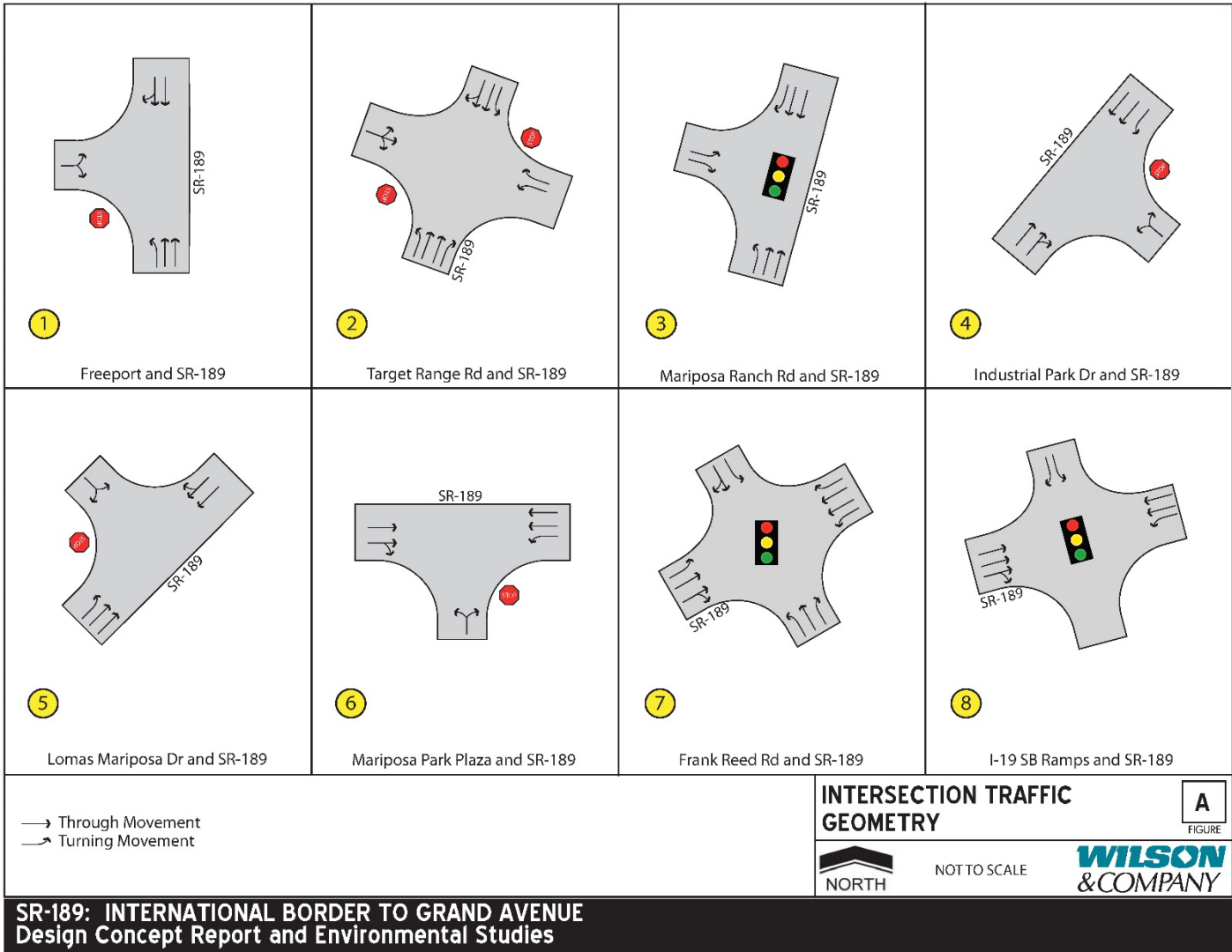
As defined in the Highway Capacity Manual 2010 (HCM 2010), LOS is a qualitative measure describing operating conditions associated with a traffic stream. The HCM 2010 defines a range of LOS parameters representing varying operating conditions at interchanges/intersections and the driver's perception of these conditions. Operating conditions are defined in terms of the average vehicle delay of all movements through an intersection, usually in seconds per vehicle.

According to HCM 2010, “vehicle delay is a method of quantifying several intangible factors, including driver discomfort, frustration, and lost travel time. Specifically, LOS criteria are stated in terms of average control delay per vehicle during a specified time period (for example, the PM peak hour).” Control delay is the portion of the total delay attributed to signal operations and includes initial deceleration, queue move-up time, stopped delay, and acceleration delay.

***Level of Service Criteria – Signalized Intersections***

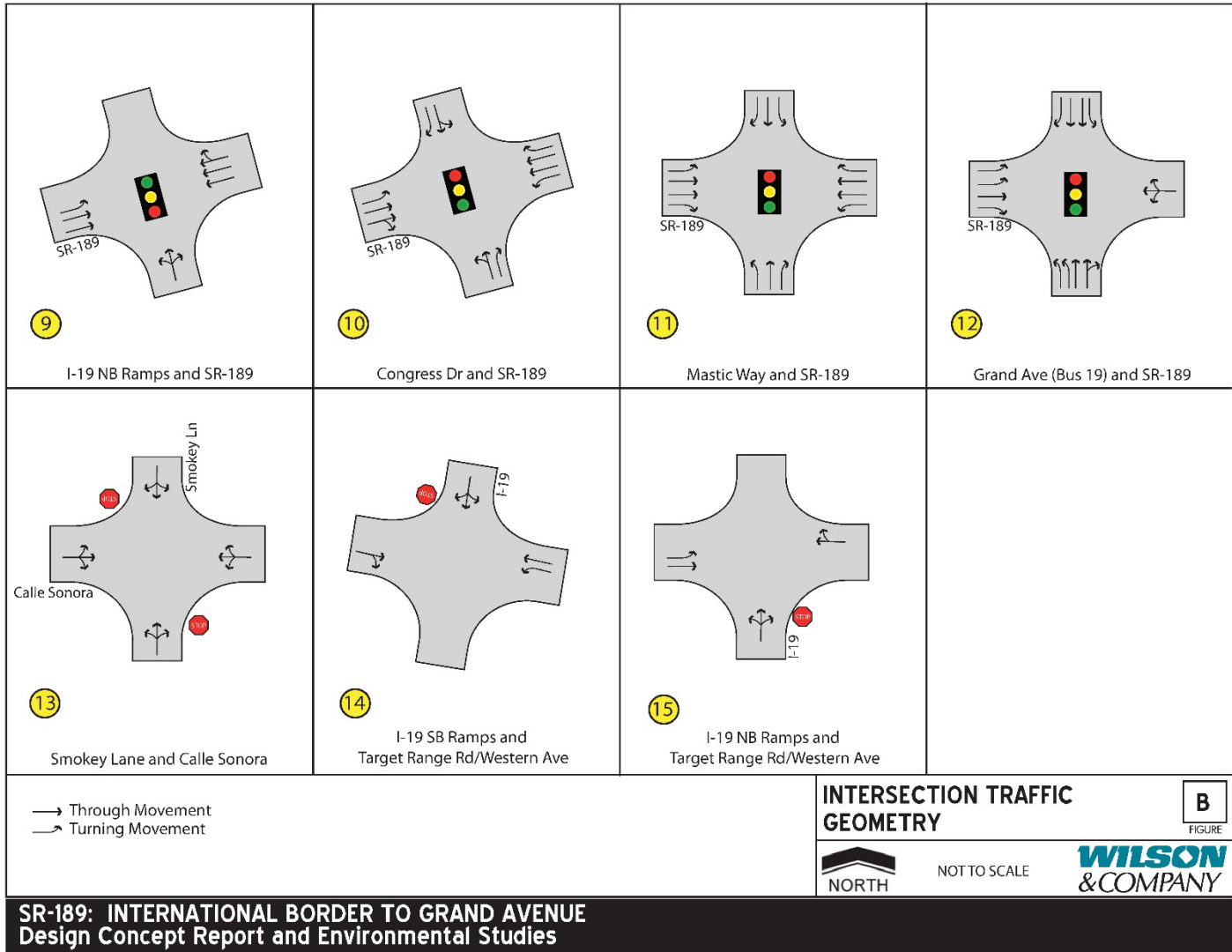
LOS associated with signalized intersections is derived through an operations analysis that measures many variables, including signal phasing (that is, progression of movements through the intersection), signal cycle length, lane geometry, and traffic volumes. The progression of movements is translated into specific vehicle operating characteristics, including initial deceleration delay, queue move-up time, stopped delay, and final acceleration delay. Table 2-4 details the LOS criteria for signalized intersections.

Figure 2-2. Lane geometry at key corridor intersections 1 through 8



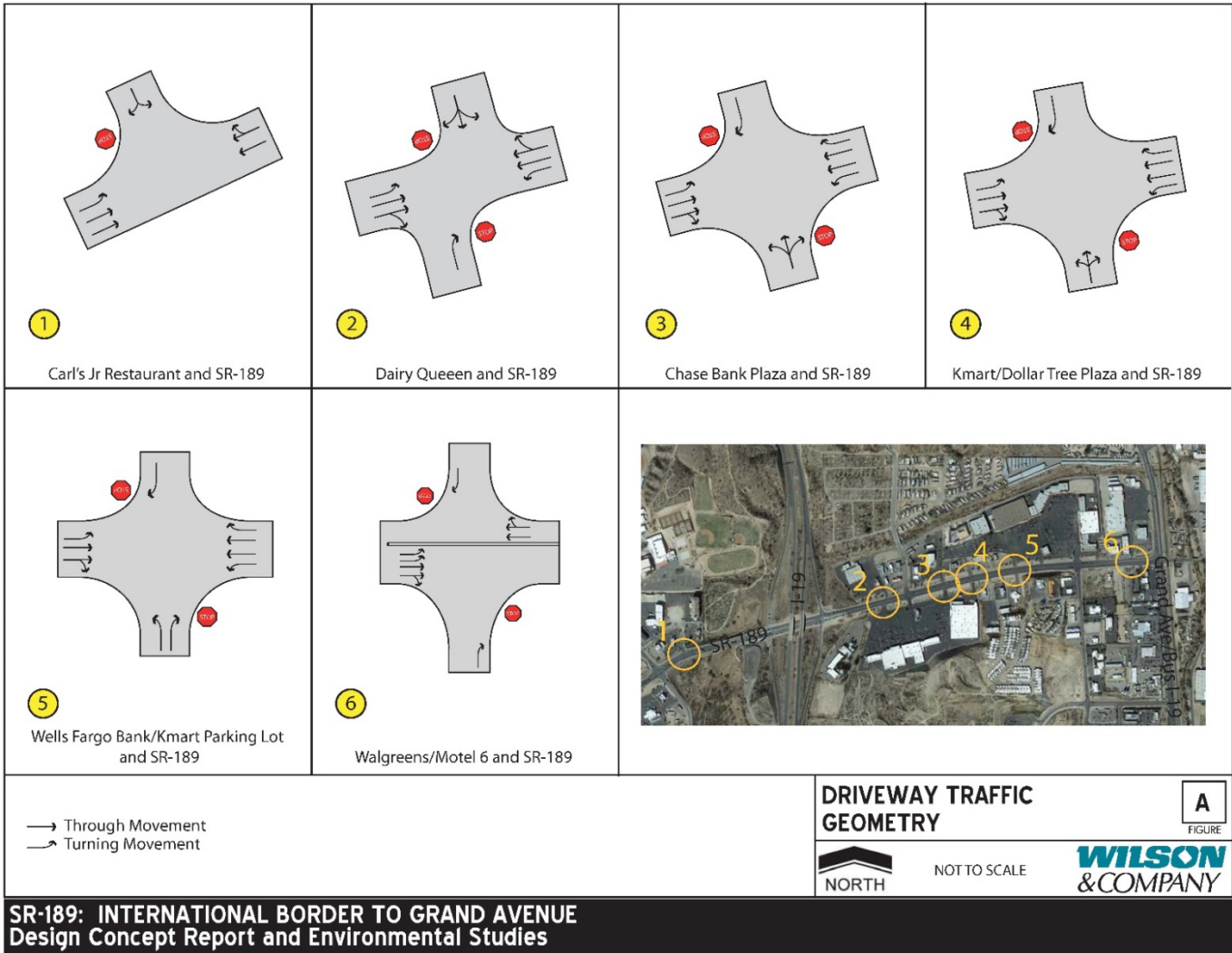
Source: Year 2040 Traffic Operations Analysis Report, February 2016, by Wilson & Co.

Figure 2-3. Lane geometry at key corridor intersections 9 through 15



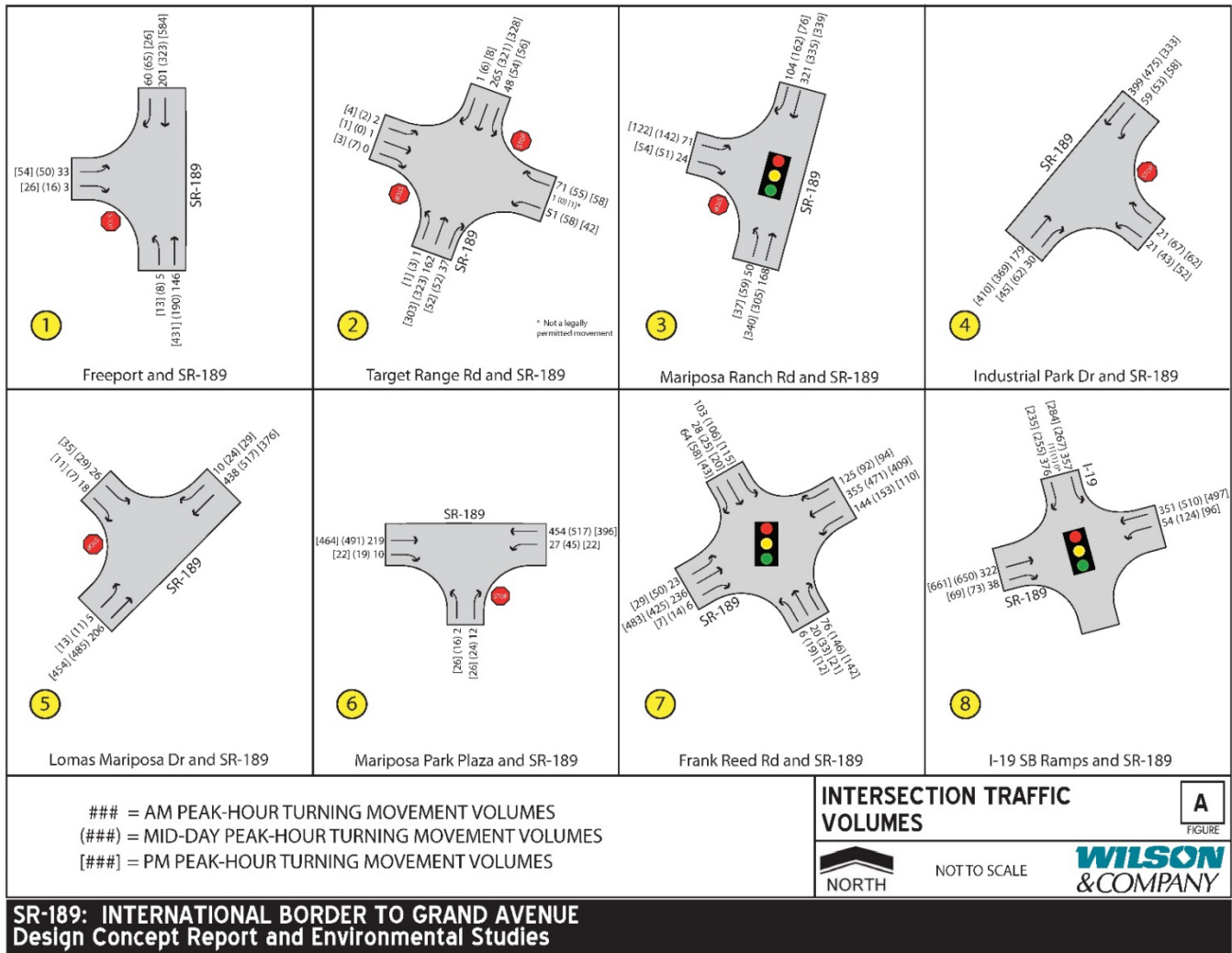
Source: Year 2040 Traffic Operations Analysis Report, February 2016, by Wilson & Co.

Figure 2-4. Lane geometry at key corridor driveways 1 through 6



Source: Year 2040 Traffic Operations Analysis Report, February 2016, by Wilson & Co,

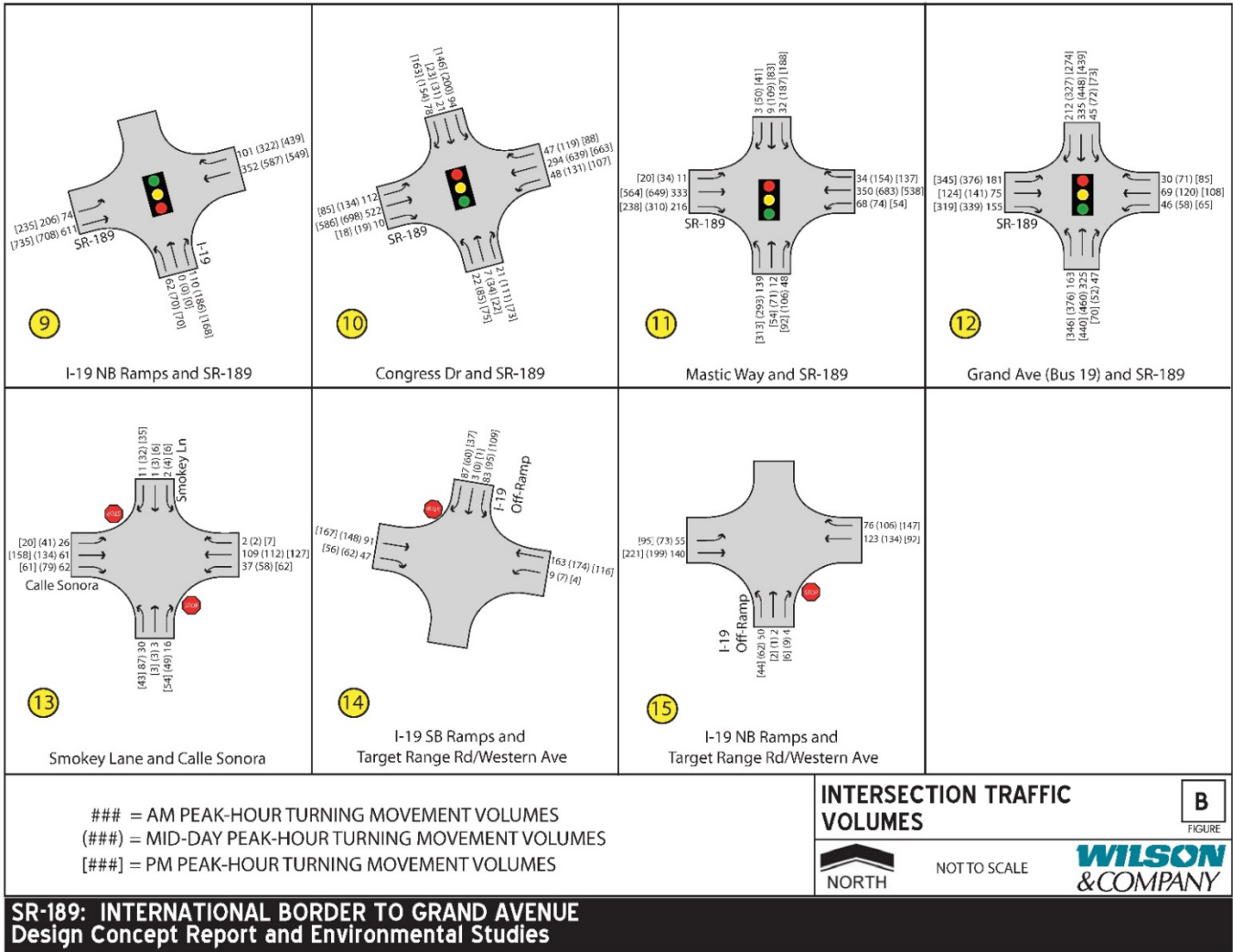
Figure 2-5. Existing 2011 peak-hour turning movements at key corridor intersections 1 through 8



Source: Year 2040 Traffic Operations Analysis Report, February 2016, by Wilson & Co.



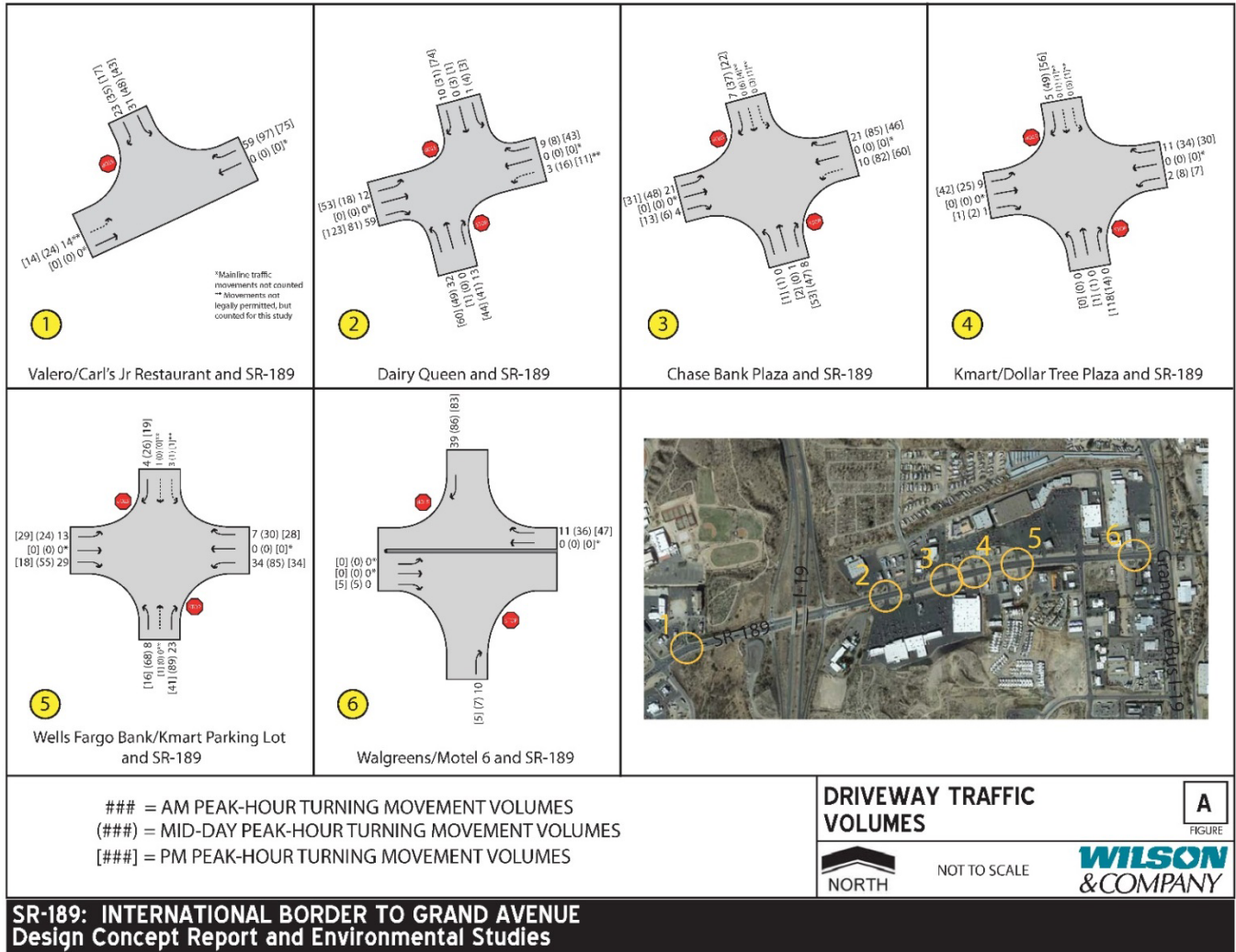
Figure 2-6. Existing 2011 peak-hour turning movements at key corridor intersections 9 through 15



Source: Year 2040 Traffic Operations Analysis Report, February 2016, by Wilson & Co.

LOS has been analyzed for 19 intersections within the SR 189/Mariposa Road corridor, using turning movement counts presented earlier. Methodologies presented in the HCM 2010 were applied, and the interchanges/intersections were evaluated using the VISSIM traffic-simulation software, which permits analysis of overall LOS for signalized intersections and all-way and stop-controlled operations at unsignalized intersections. The Year 2011 turning movement counts presented earlier were normalized to reflect the average peak-hour of traffic specific to each interchange/intersection for the a.m., midday, and p.m. peak periods. The VISSIM model was then calibrated using the peak-hour travel speeds documented in Tables 2-2 and 2-3; signal timing within the corridor was provided by ADOT. The results of this analysis process are presented in Table 2-4.

Figure 2-7. Existing 2011 peak-hour turning movements at key corridor driveways 1 through 6



Source: Year 2040 Traffic Operations Analysis Report, February 2016, by Wilson & Co.

Level of Service Analysis Results

Results indicate that, overall, the corridor intersections operate at LOS D or better in Year 2011 during each of the analyzed peak periods, which is considered acceptable in an urban area. However, the approaches at two intersections experience LOS E delays:

- SR 189 and Frank Reed Road (North Industrial Park Drive) southbound
- SR 189 and Grand Avenue westbound

At each of these locations, these delays primarily result from the allocation of green time to the approach and could likely be improved with modifications to the traffic signal timing.

Table 2-4. Level of service analysis of existing 2011 intersection operations

Intersection ID	Name	Performance Measure	AM				MIDDAY				PM			
			Northbound	Southbound	Eastbound	Westbound	Northbound	Southbound	Eastbound	Westbound	Northbound	Southbound	Eastbound	Westbound
R-1	SR 189/N. Freeport Drive (Stop)	Approach Delay (Sec)	0	0	7	0	0	5	12	0	0	18	20	0
		Approach LOS	A	A	A	A	A	A	B	A	A	C	C	A
		Intersection Delay (Sec)	n/a				n/a				n/a			
		Intersection LOS	n/a				n/a				n/a			
R-2	SR 189/Target Range Road (Stop)	Approach Delay (Sec)	0	0	2	7	0	0	6	7	0	0	4	7
		Approach LOS	A	A	A	A	A	A	A	A	A	A	A	A
		Intersection Delay (Sec)	n/a				n/a				n/a			
		Intersection LOS	n/a				n/a				n/a			
R-3	SR 189/Mariposa Ranch Road (Signal)	Approach Delay (Sec)	11	4	37	0	9	7	39	0	5	5	35	0
		Approach LOS	B	A	D	A	A	A	D	A	A	A	C	A
		Intersection Delay (Sec)	11				14				10			
		Intersection LOS	B				B				A			
R-4	SR 189/W. Industrial Park Drive (Stop)	Approach Delay (Sec)	0	0	0	6	1	0	0	8	0	0	0	8
		Approach LOS	A	A	A	A	A	A	A	A	A	A	A	A
		Intersection Delay (Sec)	n/a				n/a				n/a			
		Intersection LOS	n/a				n/a				n/a			
R-5	SR 189/Loma Mariposa Drive (Stop)	Approach Delay (Sec)	0	1	7	0	0	1	7	0	0	0	8	0
		Approach LOS	A	A	A	A	A	A	A	A	A	A	A	A
		Intersection Delay (Sec)	n/a				n/a				n/a			
		Intersection LOS	n/a				n/a				n/a			
R-6	SR 189/Mariposa Park Plaza (Stop)	Approach Delay (Sec)	5	0	0	0	8	0	0	0	7	0	0	0
		Approach LOS	A	A	A	A	A	A	A	A	A	A	A	A
		Intersection Delay (Sec)	n/a				n/a				n/a			
		Intersection LOS	n/a				n/a				n/a			
R-7	SR 189/Frank Reed Road (N. Industrial Park Drive) (Signal)	Approach Delay (Sec)	24	59	5	6	24	58	5	6	20	60	4	5
		Approach LOS	C	E	A	A	C	E	A	A	B	E	A	A
		Intersection Delay (Sec)	18				14				13			
		Intersection LOS	B				B				B			
D-1	SR 189/Valero Gas Station Entrance (Stop)	Approach Delay (Sec)	0	7	0	1	0	9	0	1	0	6	0	2
		Approach LOS	A	A	A	A	A	A	A	A	A	A	A	A
		Intersection Delay (Sec)	n/a				n/a				n/a			
		Intersection LOS	n/a				n/a				n/a			
R-8	SR 189/I-19 SB Ramp (Signal)	Approach Delay (Sec)	0	24	29	10	0	26	26	11	0	25	27	10
		Approach LOS	A	C	C	A	A	C	C	B	A	C	C	A
		Intersection Delay (Sec)	22				21				21			
		Intersection LOS	C				C				C			
R-9	SR 189/I-19 NB Ramp (Signal)	Approach Delay (Sec)	16	0	11	29	16	0	19	27	17	0	22	26
		Approach LOS	B	A	B	C	B	A	B	C	B	A	C	C
		Intersection Delay (Sec)	18				22				23			
		Intersection LOS	B				C				C			

Source: Year 2040 Traffic Operations Analysis Report, February 2016, by Wilson & Co.



Table 2-4. Level of service analysis of existing 2011 intersection operations (continued)

D-2	SR 189/Dairy Queen Entrance (Stop)	Approach Delay (Sec)	8	4	4	0	12	7	8	0	10	7	6	0
		Approach LOS	A	A	A	A	B	A	A	A	A	A	A	A
		Intersection Delay (Sec)	n/a				n/a				n/a			
		Intersection LOS	n/a				n/a				n/a			
R-10	SR 189/Congress Drive (Signal)	Approach Delay (Sec)	28	34	7	4	24	34	13	10	25	34	10	7
		Approach LOS	C	C	A	A	C	C	B	A	C	C	A	A
		Intersection Delay (Sec)	11				16				14			
		Intersection LOS	B				B				B			
D-4	SR 189/Dollar Tree Entrance (Stop)	Approach Delay (Sec)	0	3	0	0	8	5	1	0	6	5	1	0
		Approach LOS	A	A	A	A	A	A	A	A	A	A	A	A
		Intersection Delay (Sec)	n/a				n/a				n/a			
		Intersection LOS	n/a				n/a				n/a			
D-5	SR 189/Wells Fargo Entrance (Stop)	Approach Delay (Sec)	6	4	1	0	10	4	1	1	7	4	1	0
		Approach LOS	A	A	A	A	A	A	A	A	A	A	A	A
		Intersection Delay (Sec)	n/a				n/a				n/a			
		Intersection LOS	n/a				n/a				n/a			
R-11	SR 189/Mastick Way (Signal)	Approach Delay (Sec)	35	36	5	3	43	30	12	11	37	30	10	8
		Approach LOS	C	D	A	A	D	C	B	B	D	C	A	A
		Intersection Delay (Sec)	10				19				17			
		Intersection LOS	A				B				B			
D-6	SR 189/Walgreens Entrance (Stop)	Approach Delay (Sec)	5	5	1	0	3	7	4	1	1	7	4	0
		Approach LOS	A	A	A	A	A	A	A	A	A	A	A	A
		Intersection Delay (Sec)	n/a				n/a				n/a			
		Intersection LOS	n/a				n/a				n/a			
R-12	SR 189/Grand Avenue (Interstate 19 Business) (Signal)	Approach Delay (Sec)	30	18	40	56	41	27	37	59	40	26	37	57
		Approach LOS	C	B	D	E	D	C	D	E	D	C	D	E
		Intersection Delay (Sec)	30				37				37			
		Intersection LOS	C				D				D			
R-13	Calle Sonora/Smokey Lane (Stop)	Approach Delay (Sec)	7	6	3	1	9	6	4	1	9	6	4	1
		Approach LOS	A	A	A	A	A	A	A	A	A	A	A	A
		Intersection Delay (Sec)	n/a				n/a				n/a			
		Intersection LOS	n/a				n/a				n/a			

Source: Year 2040 Traffic Operations Analysis Report, February 2016, by Wilson & Co.

2.2 Future Conditions

This chapter provides detailed information on the development of traffic volume forecasts for the Year 2040 and the 2040 Base/No-Build model network as well as a summary of network deficiencies observed from 2040 Base/No-Build condition modeling.

Forecast Year 2040 Traffic Volumes

In December 2011, a *Draft Forecast Analysis Report* was prepared for the SR 189 project area. The report summarizes the methodology for forecasting Year 2014 and Year 2040 traffic volumes for use in preparation of the DCR and EA for SR 189 from the Mariposa LPOE to Grand Avenue/B-19. The following section describes the methodology used to forecast Year 2040 traffic conditions and the results of a comparison between observed 2015 traffic volumes and forecast Year 2014 volumes.

Forecast Year 2040 Roadway Segment Volumes

As described in the *Draft Forecast Analysis Report*, traffic volumes on SR 189 consist of two components, local traffic and Mariposa LPOE traffic. These two components of traffic were forecast separately and then combined to derive the total volume of traffic anticipated in the corridor for Year 2040.

The first step in deriving future year forecasts was to adjust the March 2011, base conditions to account for the cold weather damage to produce that occurred in early January 2011. The freeze heavily damaged Mexican produce crops and resulted in lower truck volumes than would typically be anticipated in the corridor. The adjusted Year 2011 volumes then served as the foundation for determining anticipated increases in each of the two traffic components, as described below.

Forecasts of Mariposa LPOE traffic were based on the maximum processing capacity of the new LPOE facility, as documented in the *Traffic Impact Assessment for Mariposa Port of Entry Executive Summary* prepared by Stantec in 2009 for the General Services Administration (GSA). This GSA study provided hourly truck, car/bus, and staff/visitor volumes. These hourly volumes were extrapolated in the *Draft Forecast Analysis Report* to arrive at daily volumes, based on the current hours of operation and processing rates at the LPOE. Table 2-5 summarizes the resulting forecasts of LPOE traffic for Year 2040. The Year 2040 estimates assume the LPOE will be operating at maximum hourly processing capacity during each of its operating hours.

Table 2-5. Existing and future Mariposa LPOE peak season daily trip generation

Year	Trucks	Passenger vehicles	Daily traffic
Existing (2011)	2,800	6,600	9,400
Future (2040)	5,700	18,400	24,100

Source: Year 2040 Traffic Operations Analysis Report, February 2016, by Wilson & Co.

The local traffic component of the Year 2040 travel forecasts were derived by growing the adjusted March 2011 volumes using a 2.42 growth factor for local trucks and buses and a 1.63 growth factor for passenger vehicles. This corresponds to an approximate 3.1 percent annual increase in local truck/bus activity and a 1.7 percent annual increase in local passenger vehicle activity.

Data from Table 15 of the *Draft Forecast Analysis Report* were used as the basis for Table 2-6, which summarizes both the LPOE and local components, as well as the combined daily traffic in Year 2040, thus providing the foundation for the analysis of Year 2040 traffic conditions.

Table 2-6. Forecast year 2040 traffic Volumes

Segment	Trucks			Passenger vehicles			Daily traffic
	LPOE <sup>a</sup>	Local <sup>b</sup>	Total	LPOE <sup>c</sup>	Local <sup>d</sup>	Total	
Mariposa LPOE to Target Range Road	5,700	— <sup>e</sup>	5,700	18,400	4,570	22,970	28,670
Target Range Road to West Industrial Park Drive	4,000	490	4,490	16,400	7,180	23,580	28,070
West Industrial Park Drive to Frank Reed/North Industrial Park Drive	2,500	2,190	4,690	14,400	8,480	22,880	27,570
Frank Reed to I-19	2,300	3,640	5,940	12,000	20,150	32,150	38,090
East of I-19	920	2,430	3,350	7,400	26,750	34,150	37,500
West of Grand Avenue	900	2,360	3,260	1,000	25,760	26,760	30,020

<sup>a</sup> Daily truck trip generation forecast reflects LPOE maximum capacity.  
<sup>b</sup> Local trucks were forecast by applying a 2.42 growth factor to the 2011 estimated trucks and buses.  
<sup>c</sup> Daily passenger vehicle trip generation forecast reflects LPOE maximum capacity.  
<sup>d</sup> Local passenger vehicles were forecast by applying a 1.630 growth factor to the 2011 estimated trucks and buses.  
<sup>e</sup> Indicates no local truck traffic to the Mariposa LPOE.

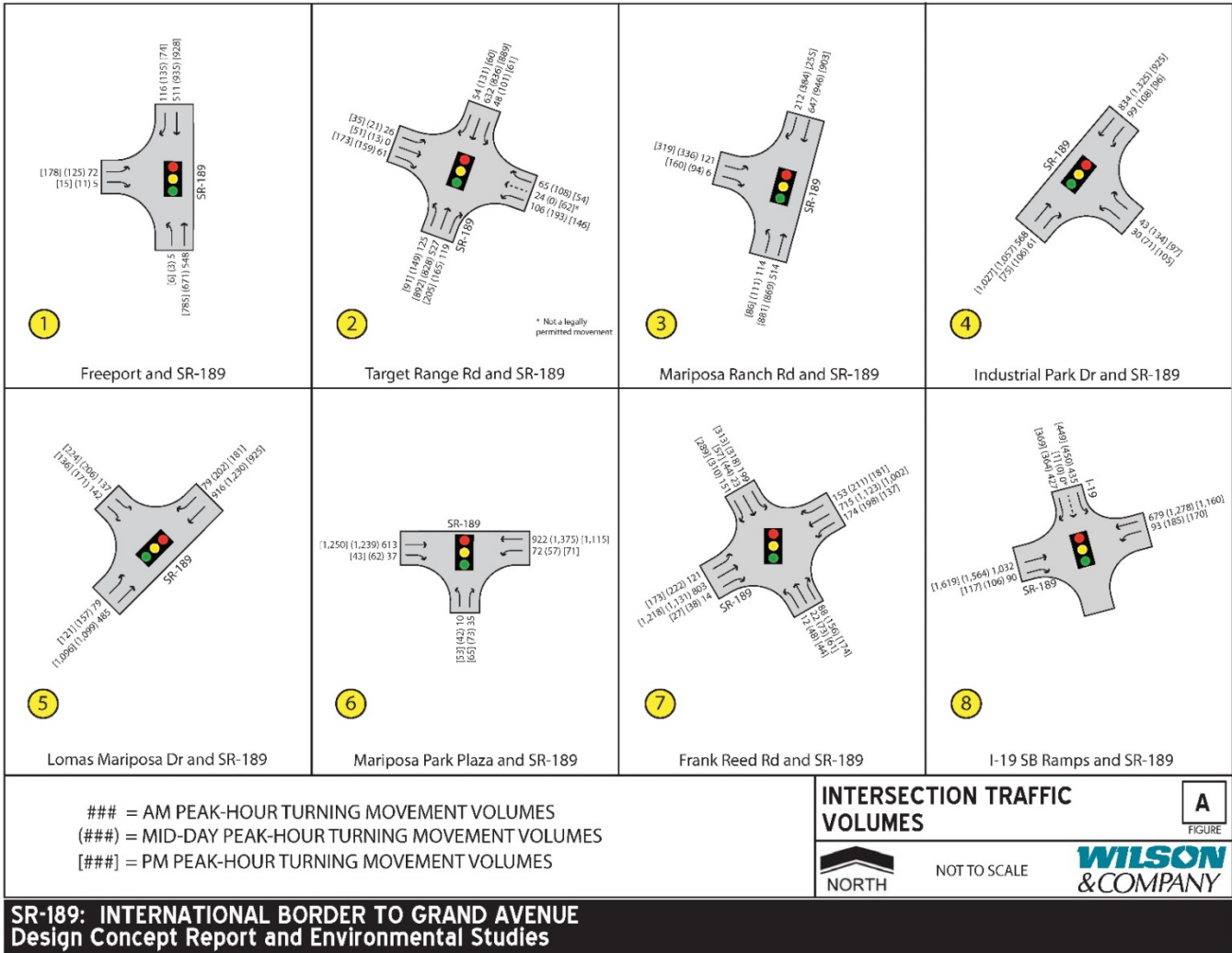
Interchanges and Intersections

Peak-hour turning movement volumes were derived from the Year 2040 segment volumes using methodology documented in *NCHRP 255, Highway Traffic Data for Urbanized Area Project Planning and Design*. This methodology translates future daily volume forecasts on roadway segments to peak-hour turning movements based on a variety of factors, including existing Year 2011 peak-hour factors, directional factors, and turn percentages.

Turn movements were developed for the Forecast Year 2040 a.m., midday, and p.m. peak periods. The resulting volumes for the a.m., midday, and p.m. peak hours are summarized in Figures 2-8 and 2-9.

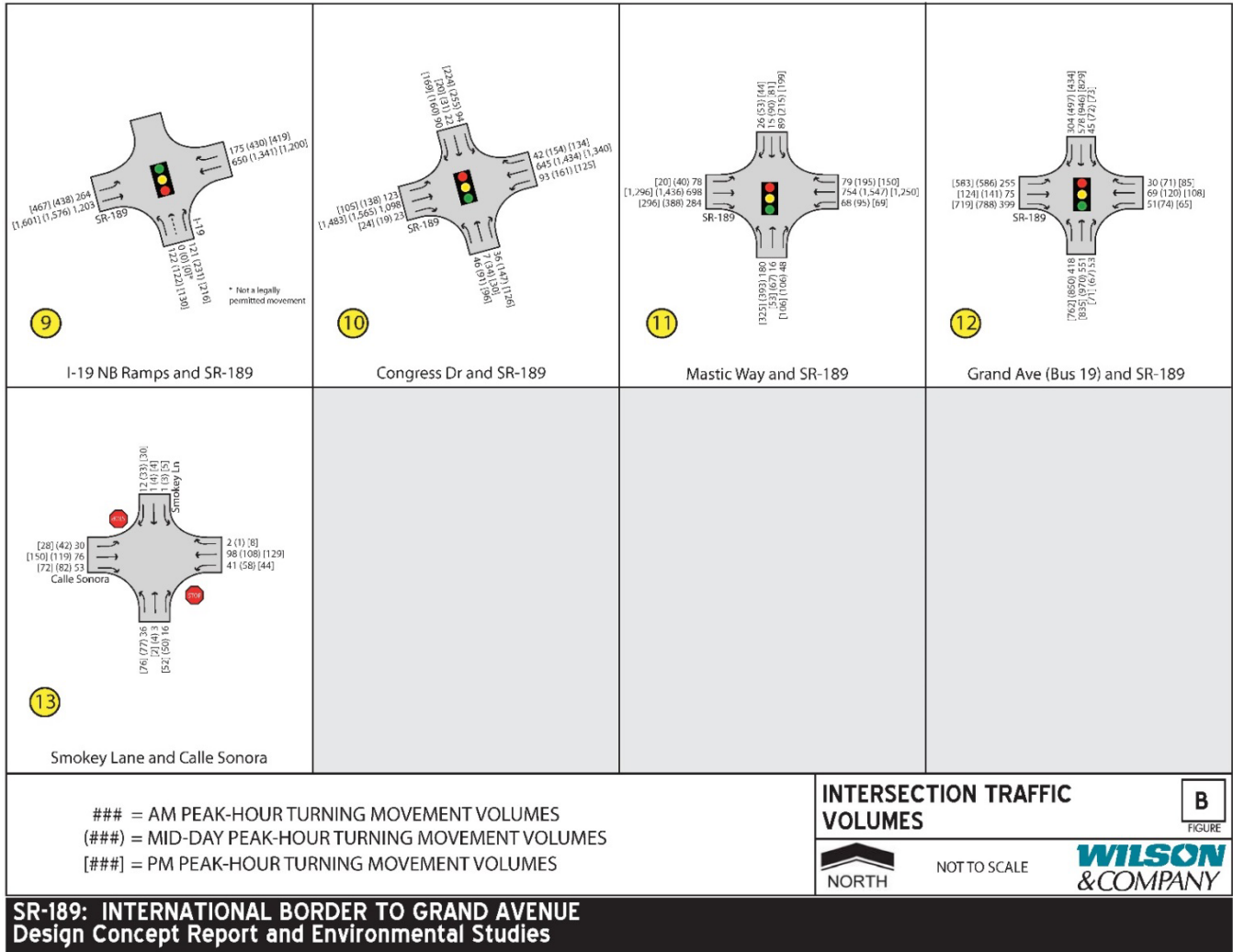


Figure 2-8. Forecast Year 2040 peak hour turning movements at key corridor intersections 1 through 8



Source: Year 2040 Traffic Operations Analysis Report, February 2016, by Wilson & Co.

Figure 2-9. Forecast Year 2040 peak hour turning movements at key corridor intersections 9 through 13



Source: Year 2040 Traffic Operations Analysis Report, February 2016, by Wilson & Co.

Validation of Traffic Forecasts

In March 2015, updated counts were conducted to confirm the validity of the methodology used to forecast Year 2040 traffic volumes. In 2014, a separate traffic study was prepared to develop near-term recommendations at the I-19 TI. In conjunction with that effort, the forecasting methodology described previously was employed to develop estimates of Year 2014 traffic volumes. Table 2-7 provides a comparison of Year 2014 daily traffic volume forecasts with those observed in association with the March 2015 data collection for two selected locations. As indicated in the table, observed traffic activity appears consistent with the forecast data in both locations.

Table 2-7. Comparison of Forecast Year 2014 daily traffic volumes with current Year 2015 conditions

Location	Fall 2014 Forecast (after expanded LPOE opens)	2015 observed
LPOE to Target Range Road	13,250	12,159
Frank Reed to I-19	21,590	21,975

Source: Year 2040 Traffic Operations Analysis Report, February 2016, by Wilson & Co.

The data were also reviewed to determine the consistency of the Year 2014 forecast peak-hour volumes with the observed traffic volumes. Table 2-8 summarizes this comparison for the a.m., midday, and p.m. peak hours. As indicated in the table, observed traffic activity appears consistent with the forecast data for each peak period at the two selected locations. In all cases, forecast volumes used in the analysis are slightly higher and, therefore, more conservative.

Table 2-8. Comparison of forecast Year 2014 peak period traffic volumes with current year 2015 conditions

Peak hour	Fall 2014 Forecast (after expanded LPOE opens)	2015 observed
LPOE to Target Range Road		
AM	666	631
Midday	964	948
PM	990	953
Frank Reed Road to I-19		
AM	1,280	1,253
Midday	1,793	1,659
PM	1,751	1,595

Source: Year 2040 Traffic Operations Analysis Report, February 2016, by Wilson & Co.

Based on the results of these comparisons, it appears that the methodology used to forecast Year 2014 and Year 2040 traffic data seems reasonable. Therefore, it is recommended that future traffic analyses associated with the development of alternatives for the DCR and EA continue to be based on previously forecast volumes for Year 2040.

Comparison of Interim and Ultimate Plans

Performance of the No-Build or Base Condition, Interim Plan, and Ultimate Plan was evaluated based on travel time and intersection LOS. Travel times were recorded for eight directional segments along the corridor and were used to compare the effectiveness of the Interim Plan and Ultimate Plan with each other and with the No-Build Condition.

Table 2-9 summarizes the travel times, highlighting the best (green) and worst (red) condition for all eight directional segments. Intersection LOS also was evaluated at key intersections near the TI, from Loma Mariposa Road in the west to Congress Drive in the east. Results of this evaluation are summarized in Table 2-10 for the midday peak and in Table 2-11 for the p.m. peak.

Tables 2-12 and 2-13 compare LOS conditions at all intersections in the corridor for forecasts developed for the midday and p.m. peaks, based on the Interim Plan and Ultimate Plan, defined as a result of this study.

With the exception of Grand Avenue in the midday peak hour, the intersections associated with the Interim and the Ultimate Conditions performed at an acceptable LOS. The controlling movement is the left-turn movement from northbound Grand Avenue to westbound SR 189. Options to improve this intersection would be to add additional turn lanes and through lanes and/or optimize signal timings.

Table 2-9. Preferred alternative Year 2040 travel times

Alternative				MID		PM	
	FROM	TO	DISTANCE (MILES)	TRAVEL TIME (MIN)	VELOCITY (MPH)	TRAVEL TIME (MIN)	VELOCITY (MPH)
Base	FREEPORT DR	GRAND AVE	3.4	17.5	11.6	17.0	12.0
	GRAND AVE	FREEPORT DR	3.4	12.6	16.2	11.7	17.5
	FREEPORT DR	I-19 SB RAMPS	2.6	13.9	11.3	14.1	11.1
	I-19 SB RAMPS	GRAND AVE	0.8	4.5	10.7	3.4	13.9
	GRAND AVE	I-19 SB RAMPS	0.8	3.3	14.6	3.0	15.9
	I-19 SB RAMPS	FREEPORT DR	2.6	9.5	16.5	8.8	17.8
	FREEPORT DR	I-19 NB	2.9	16.3	10.7	15.9	10.9
	I-19 SB	FREEPORT DR	2.9	10.4	16.8	9.7	17.9
Interim: EB-NB Direct Connector without Grade Separation at Frank Reed Road	FROM	TO	DISTANCE (MILES)	TRAVEL TIME (MIN)	VELOCITY (MPH)	TRAVEL TIME (MIN)	VELOCITY (MPH)
	FREEPORT DR	GRAND AVE	3.4	10.1	20.1	10.1	20.2
	GRAND AVE	FREEPORT DR	3.4	9.7	21.0	9.2	22.1
	FREEPORT DR	I-19 SB RAMPS	2.6	6.7	23.2	6.8	22.8
	I-19 SB RAMPS	GRAND AVE	0.8	3.7	12.9	3.6	13.4
	GRAND AVE	I-19 SB RAMPS	0.8	2.3	20.7	2.4	20.2
	I-19 SB RAMPS	FREEPORT DR	2.6	7.5	20.9	7.0	22.3
	FREEPORT DR	I-19 NB	2.9	7.4	23.6	7.5	23.3
Ultimate: EB-NB and SB WB Direct Connector with Grade Separation at Frank Reed Road	FROM	TO	DISTANCE (MILES)	TRAVEL TIME (MIN)	VELOCITY (MPH)	TRAVEL TIME (MIN)	VELOCITY (MPH)
	FREEPORT DR	GRAND AVE	3.4	10.2	19.9	10.0	20.3
	GRAND AVE	FREEPORT DR	3.4	9.4	21.7	9.1	22.4
	FREEPORT DR	I-19 SB RAMPS	2.6	5.7	27.2	5.9	26.5
	I-19 SB RAMPS	GRAND AVE	0.8	3.8	12.6	3.5	13.9
	GRAND AVE	I-19 SB RAMPS	0.8	2.3	20.6	2.4	19.7
	I-19 SB RAMPS	FREEPORT DR	2.6	7.0	22.2	6.8	23.0
	FREEPORT DR	I-19 NB	2.9	6.3	27.4	6.5	26.8
	I-19 SB	FREEPORT DR	2.9	7.4	23.4	7.2	24.1

Source: Year 2040 Traffic Operations Analysis Report, February 2016, by Wilson & Co.

Table 2-10. Preferred Alternative — Year 2040 intersection LOS for affected intersections, midday peak

Intersection ID	Name	Performance Measure	Base				A1 Interim				A1 Ultimate			
			Northbound	Southbound	Eastbound	Westbound	Northbound	Southbound	Eastbound	Westbound	Northbound	Southbound	Eastbound	Westbound
R-5	SR 189/Loma Mariposa Road (Signal)	Approach Delay (Sec)	109	66	132	-	24	18	55	35	22	15	48	36
		Approach LOS	F	E	F	A	C	B	D	C	C	B	D	D
		Intersection Delay (Sec)	91				26				24			
		Intersection LOS	F				C				C			
R-6	SR 189/Mariposa Park Plaza (Base-Signal; Interim,Ultimate-Stop)	Approach Delay (Sec)	76	-	114	39	Blacked-out cells indicate the critical access approach or driveway at this intersection has been eliminated or converted to right-in/right-out movements only, i.e., eliminating movements that cut across through traffic.							
		Approach LOS	E	A	F	D								
		Intersection Delay (Sec)	72											
		Intersection LOS	E											
R-7	SR 189/Frank Reed Road (N. Industrial Park Drive) (Signal)	Approach Delay (Sec)	68	140	147	44	57	48	51	35	43	48	42	26
		Approach LOS	E	F	F	D	E	D	D	C	D	D	D	C
		Intersection Delay (Sec)	97				44				37			
		Intersection LOS	F				D				D			
D-1	SR 189/Carls Jr. Road (Stop)	Approach Delay (Sec)	-	189	20	34	Blacked-out cells indicate the critical access approach or driveway at this intersection has been eliminated or converted to right-in/right-out movements only, i.e., eliminating movements that cut across through traffic.							
		Approach LOS	A	F	C	D								
		Intersection Delay (Sec)	29											
		Intersection LOS	D											
R-8	SR 189/I-19 SB Ramp (Signal)	Approach Delay (Sec)	-	43	82	14	-	46	15	8	-	50	16	7
		Approach LOS	A	D	F	B	A	D	B	A	A	D	B	A
		Intersection Delay (Sec)	46				19				18			
		Intersection LOS	D				B				B			
R-9	SR 189/I-19 NB Ramp (Signal)	Approach Delay (Sec)	35	-	44	39	29	-	11	11	30	-	11	12
		Approach LOS	C	A	D	D	C	A	B	B	C	A	B	B
		Intersection Delay (Sec)	41				13				13			
		Intersection LOS	D				B				B			
D-2	SR 189/Dairy Queen Entrance (Stop)	Approach Delay (Sec)	56	15	39	3	27	17	15	2	26	16	15	1
		Approach LOS	F	B	E	A	D	C	B	A	D	C	B	A
		Intersection Delay (Sec)	22				9				9			
		Intersection LOS	C				A				A			
R-10	SR 189/Congress Drive (Signal)	Approach Delay (Sec)	45	66	14	23	45	48	11	18	46	48	11	18
		Approach LOS	D	E	B	C	D	D	B	B	D	D	B	B
		Intersection Delay (Sec)	26				20				20			
		Intersection LOS	C				B				B			

Source: Year 2040 Traffic Operations Analysis Report, February 2016, by Wilson & Co.



Table 2-11. Preferred Alternative – - Year 2040 intersection LOS for affected intersections, PM peak

Intersection ID	Name	Performance Measure	Base				A1 Interim				A1 Ultimate			
			Northbound	Southbound	Eastbound	Westbound	Northbound	Southbound	Eastbound	Westbound	Northbound	Southbound	Eastbound	Westbound
R-5	SR 189/Loma Mariposa Road (Signal)	Approach Delay (Sec)	109	66	132	-	24	18	55	35	22	15	48	36
		Approach LOS	F	E	F	A	C	B	D	C	C	B	D	D
		Intersection Delay (Sec)	91				26				24			
		Intersection LOS	F				C				C			
R-6	SR 189/Mariposa Park Plaza (Base-Signal; Interim,Ultimate-Stop)	Approach Delay (Sec)	76	-	114	39	Blacked-out cells indicate the critical access approach or driveway at this intersection has been eliminated or converted to right-in/right-out movements only, i.e., eliminating movements that cut across through traffic.							
		Approach LOS	E	A	F	D								
		Intersection Delay (Sec)	72											
		Intersection LOS	E											
R-7	SR 189/Frank Reed Road (N. Industrial Park Drive) (Signal)	Approach Delay (Sec)	68	140	147	44	57	48	51	35	43	48	42	26
		Approach LOS	E	F	F	D	E	D	D	C	D	D	D	C
		Intersection Delay (Sec)	97				44				37			
		Intersection LOS	F				D				D			
D-1	SR 189/Carls Jr. Road (Stop)	Approach Delay (Sec)	-	189	20	34	Blacked-out cells indicate the critical access approach or driveway at this intersection has been eliminated or converted to right-in/right-out movements only, i.e., eliminating movements that cut across through traffic.							
		Approach LOS	A	F	C	D								
		Intersection Delay (Sec)	29											
		Intersection LOS	D											
R-8	SR 189/I-19 SB Ramp (Signal)	Approach Delay (Sec)	-	43	82	14	-	46	15	8	-	50	16	7
		Approach LOS	A	D	F	B	A	D	B	A	A	D	B	A
		Intersection Delay (Sec)	46				19				18			
		Intersection LOS	D				B				B			
R-9	SR 189/I-19 NB Ramp (Signal)	Approach Delay (Sec)	35	-	44	39	29	-	11	11	30	-	11	12
		Approach LOS	C	A	D	D	C	A	B	B	C	A	B	B
		Intersection Delay (Sec)	41				13				13			
		Intersection LOS	D				B				B			
D-2	SR 189/Dairy Queen Entrance (Stop)	Approach Delay (Sec)	56	15	39	3	27	17	15	2	26	16	15	1
		Approach LOS	F	B	E	A	D	C	B	A	D	C	B	A
		Intersection Delay (Sec)	22				9				9			
		Intersection LOS	C				A				A			
R-10	SR 189/Congress Drive (Signal)	Approach Delay (Sec)	45	66	14	23	45	48	11	18	46	48	11	18
		Approach LOS	D	E	B	C	D	D	B	B	D	D	B	B
		Intersection Delay (Sec)	26				20				20			
		Intersection LOS	C				B				B			

Source: Year 2040 Traffic Operations Analysis Report, February 2016, by Wilson & Co.

Table 2-12. Preferred Alternative – Year 2040 LOS for all intersections: Interim v. Ultimate Plan, midday and PM

Intersection ID	Name	Performance Measure	MID Interim				MID Ultimate				PM Interim				PM Ultimate			
			Northbound	Southbound	Eastbound	Westbound	Northbound	Southbound	Eastbound	Westbound	Northbound	Southbound	Eastbound	Westbound	Northbound	Southbound	Eastbound	Westbound
R-1	SR 189/N. Freeport Drive (Signal)	Approach Delay (Sec)	6	10	30	-	6	10	29	-	8	11	38	-	8	12	38	-
		Approach LOS	A	A	C	A	A	A	C	A	A	B	D	A	A	B	D	A
		Intersection Delay (Sec)	10				10				12				13			
		Intersection LOS	A				A				B				B			
R-2	SR 189/Target Range Road (Signal)	Approach Delay (Sec)	21	44	16	44	21	45	15	50	19	37	35	73	19	38	33	86
		Approach LOS	C	D	B	D	C	D	B	D	B	D	C	E	B	D	C	F
		Intersection Delay (Sec)	32				33				33				34			
		Intersection LOS	C				C				C				C			
R-3	SR 189/Mariposa Ranch Road (Signal)	Approach Delay (Sec)	6	33	73	-	6	28	73	-	5	25	57	-	5	24	57	-
		Approach LOS	A	C	E	A	A	C	E	A	A	C	E	A	A	C	E	A
		Intersection Delay (Sec)	30				27				24				23			
		Intersection LOS	C				C				C				C			
R-4	SR 189/W. Industrial Park Drive (Base-Signal; Interim,Ultimate-Stop)	Approach Delay (Sec)	5	4	-	20	4	5	-	19	4	4	-	16	4	4	-	16
		Approach LOS	A	A	A	C	A	A	A	C	A	A	A	C	A	A	A	C
		Intersection Delay (Sec)	5				5				4				4			
		Intersection LOS	A				A				A				A			
R-5	SR 189/Loma Mariposa Road (Signal)	Approach Delay (Sec)	24	18	55	35	22	15	48	36	24	17	48	34	25	17	48	38
		Approach LOS	C	B	D	C	C	B	D	D	C	B	D	C	C	B	D	D
		Intersection Delay (Sec)	26				24				25				26			
		Intersection LOS	C				C				C				C			
R-6	SR 189/Mariposa Park Plaza (Base-Signal; Interim,Ultimate-Stop)	Approach Delay (Sec)	Blacked-out cells indicate the critical access approach or driveway at this intersection has been eliminated or converted to right-in/right-out movements only, i.e., eliminating movements that cut across through traffic.															
		Approach LOS																
		Intersection Delay (Sec)																
		Intersection LOS																
R-7	SR 189/Frank Reed Road (N. Industrial Park Drive) (Signal)	Approach Delay (Sec)	57	48	51	35	43	48	42	26	56	45	41	23	43	40	38	19
		Approach LOS	E	D	D	C	D	D	D	C	E	D	D	C	D	D	D	B
		Intersection Delay (Sec)	44				37				35				31			
		Intersection LOS	D				D				C				C			
D-1	SR 189/Carls Jr. Road (Stop)	Approach Delay (Sec)	Blacked-out cells indicate the critical access approach or driveway at this intersection has been eliminated or converted to right-in/right-out movements only, i.e., eliminating movements that cut across through traffic.															
		Approach LOS																
		Intersection Delay (Sec)																
		Intersection LOS																
R-8	SR 189/I-19 SB Ramp (Signal)	Approach Delay (Sec)	-	46	15	8	-	50	16	7	-	45	15	9	-	48	19	7
		Approach LOS	A	D	B	A	A	D	B	A	A	D	B	A	A	D	B	A
		Intersection Delay (Sec)	19				18				19				20			
		Intersection LOS	B				B				B				B			

Source: Year 2040 Traffic Operations Analysis Report, February 2016, by Wilson & Co.

Table 2-13. Preferred Alternative – Year 2040 LOS for all intersections: Interim v. Ultimate Plan, midday and PM

Intersection ID	Name	Performance Measure	MID Interim				MID Ultimate				PM Interim				PM Ultimate			
			Northbound	Southbound	Eastbound	Westbound	Northbound	Southbound	Eastbound	Westbound	Northbound	Southbound	Eastbound	Westbound	Northbound	Southbound	Eastbound	Westbound
R-9	SR 189/I-19 NB Ramp (Signal)	Approach Delay (Sec)	29	-	11	11	30	-	11	12	29	-	11	13	30	-	10	17
		Approach LOS	C	A	B	B	C	A	B	B	C	A	B	B	C	A	A	B
		Intersection Delay (Sec)	13				13				14				15			
		Intersection LOS	B				B				B				B			
D-2	SR 189/Dairy Queen Entrance (Stop)	Approach Delay (Sec)	27	17	15	2	26	16	15	1	22	16	9	1	23	16	10	1
		Approach LOS	D	C	B	A	D	C	B	A	C	C	A	A	C	C	A	A
		Intersection Delay (Sec)	9				9				6				6			
		Intersection LOS	A				A				A				A			
R-10	SR 189/Congress Drive (Signal)	Approach Delay (Sec)	45	48	11	18	46	48	11	18	48	46	7	13	46	48	7	13
		Approach LOS	D	D	B	B	D	D	B	B	D	D	A	B	D	D	A	B
		Intersection Delay (Sec)	20				20				16				17			
		Intersection LOS	B				B				B				B			
D-3	Chase Bank Entrance (Stop)	Approach Delay (Sec)	Blacked-out cells indicate the critical access approach or driveway at this intersection has been eliminated or converted to right-in/right-out movements only, i.e., eliminating movements that cut across through traffic.															
		Approach LOS																
		Intersection Delay (Sec)																
		Intersection LOS																
D-4	SR 189/Dollar Tree Entrance (Stop)	Approach Delay (Sec)	21	17	5	7	22	17	5	8	19	12	3	4	19	13	4	4
		Approach LOS	C	C	A	A	C	C	A	A	C	B	A	A	C	B	A	A
		Intersection Delay (Sec)	7				7				4				4			
		Intersection LOS	A				A				A				A			
D-5	SR 189/Wells Fargo Entrance (Stop)	Approach Delay (Sec)	42	8	9	6	41	9	10	6	78	6	5	4	74	6	5	5
		Approach LOS	E	A	A	A	E	A	A	A	F	A	A	A	F	A	A	A
		Intersection Delay (Sec)	9				9				8				8			
		Intersection LOS	A				A				A				A			
R-11	SR 189/Mastick Way (Signal)	Approach Delay (Sec)	90	79	39	16	86	93	40	15	58	50	35	16	58	55	35	16
		Approach LOS	F	E	D	B	F	F	D	B	E	D	C	B	E	D	C	B
		Intersection Delay (Sec)	43				44				32				33			
		Intersection LOS	D				D				C				C			
D-6	SR 189/Walgreens Entrance (Stop)	Approach Delay (Sec)	3	14	21	1	4	16	23	1	9	15	22	1	8	15	18	1
		Approach LOS	A	B	C	A	A	C	C	A	A	B	C	A	A	B	C	A
		Intersection Delay (Sec)	10				11				11				9			
		Intersection LOS	A				B				B				A			
R-12	SR 189/Grand Avenue (I-19 Business) (Signal)	Approach Delay (Sec)	65	76	38	99	66	81	40	87	63	38	41	72	64	39	38	76
		Approach LOS	E	E	D	F	E	F	D	F	E	D	D	E	E	D	D	E
		Intersection Delay (Sec)	63				65				50				50			
		Intersection LOS	E				E				D				D			
R-13	Calle Sonora/Smokey Lane (Stop)	Approach Delay (Sec)	11	7	1	1	9	7	1	1	9	7	1	1	9	6	1	1
		Approach LOS	B	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A
		Intersection Delay (Sec)	4				3				3				3			
		Intersection LOS	A				A				A				A			

Source: Year 2040 Traffic Operations Analysis Report, February 2016, by Wilson & Co.

3.0 Evaluation of Alternatives

This chapter summarizes the development and evaluation of the range of alternatives that were studied for the proposed action to improve vehicular access, circulation, LOS, mobility, and traffic safety on SR 189 between the Mariposa POE and Grand Avenue, including the Mariposa TI at I 19 and SR 189. This section presents the information available and used at the time of selection. Since that time, elements of the Recommended Build Alternative have been further developed; therefore, values presented in Section 4.0, *Major Design Features of the Recommended Build Alternative*, may not match those presented in this section.

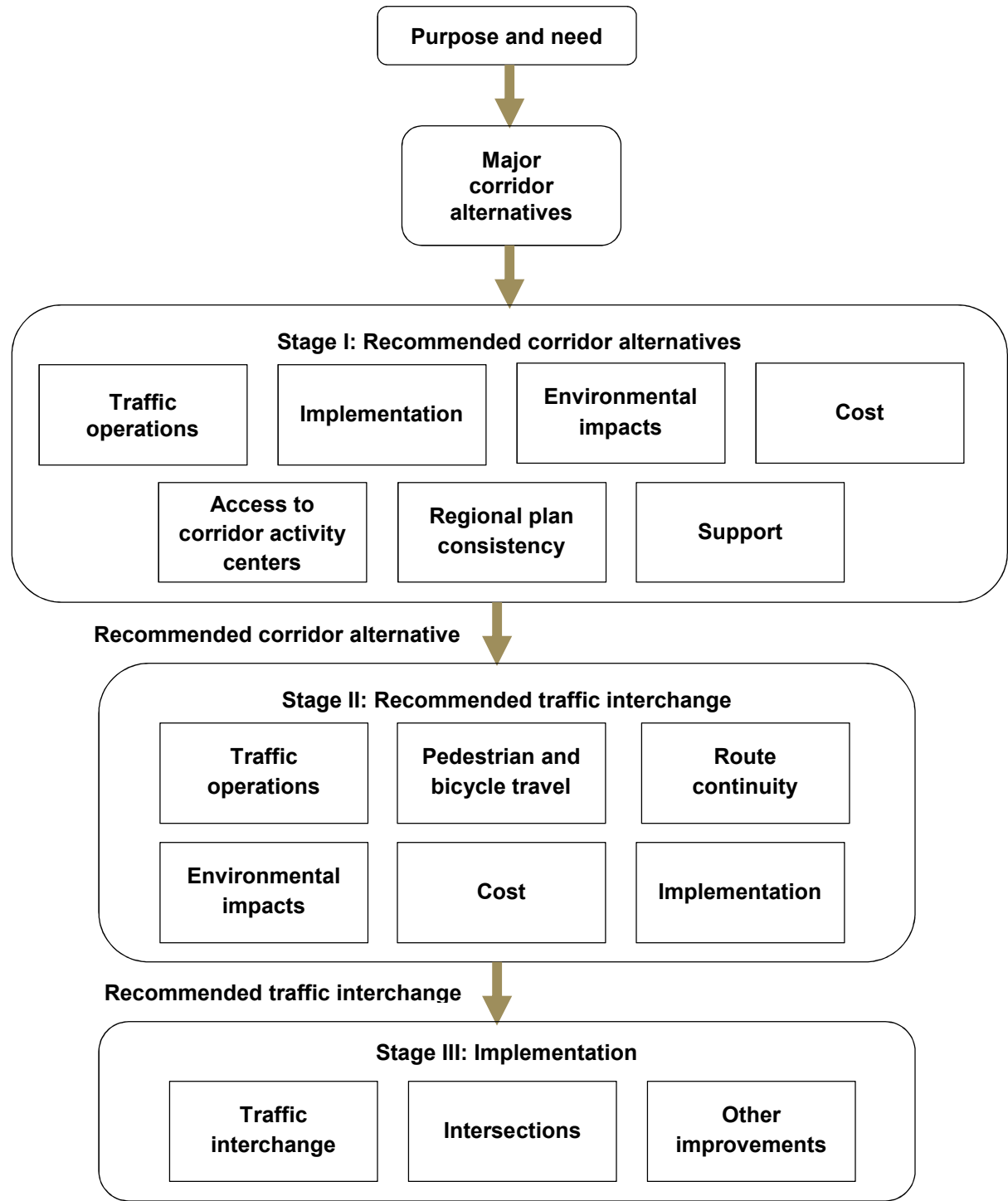
A *State Route 189, International Border to Grand Avenue, Alternative Screening Document* (ADOT 2015b) was prepared and is the basis of the alternatives evaluated in this document’s companion EA. The screening document evaluated three corridor build alternatives and the No-Build Alternative. A detailed evaluation of the existing and 2040 design year traffic requirements for the EA’s proposed action is documented in the *Year 2040 Traffic Operations Analysis Report* (Wilson & Company 2016).

Upon selection of the SR 189 recommended corridor build alternative, six Mariposa TI improvement options were evaluated and two were recommended for further analysis to become part of the overall SR 189 Recommended Build Alternative. The corridor alternatives and TI options were developed to meet the purpose and need of the EA’s proposed action, as described in Part II, Project Purpose and Need,. The Mariposa TI options were evaluated independently as part of the Recommended Build Alternative in this section because FHWA requires a separate analysis when a proposed roadway project involves any changes in access that involve the U.S. Interstate Highway System. Figure 3-1 shows the steps involved to evaluate and select the recommended SR 189 corridor build alternative and Mariposa TI options, along with the criteria used to evaluate them. Alternatives Considered

A screening process described in the *State Route 189, International Border to Grand Avenue, Alternative Screening Document* was developed to identify, screen, and select reasonable, feasible, and practicable corridor build alternatives and TI options.

The corridor build alternatives and subsequent TI options were developed using criteria based on research, guidance, input, and recommendations by a study team consisting of representatives from ADOT, FHWA’s Arizona Office, and their designated engineering and environmental consultants. Input on issues, concerns, and opportunities gathered from agencies, members of the public, and key stakeholders—including the City of Nogales, Santa Cruz County, and other public and private organizations—also informed the alternatives development process through agency and public scoping meetings and other forms of input, such as a study website and regular stakeholder meetings.

Figure 3-1. State Route 189 corridor build alternatives and Mariposa Traffic Interchange selection process



Source: Arizona Department of Transportation (2015b)



Corridor Alternatives

A corridor study resulted in the development of three corridor build alternatives for improving access, LOS, circulation, and mobility on SR 189 between the Mariposa POE and Grand Avenue. The initial corridor alternatives development process was based an analysis of the following:

- previous SR 189 and Mariposa POE studies to meet SR 189 transportation planning objectives
- consistency with the new I-11 High Priority Corridor in the Nogales area involving SR 189 and I-19 (as discussed previously in Section 1.2, *Project Background*)
- existing and planned future SR 189 corridor land uses
- existing and forecast future traffic conditions
- corridor traffic and commodity forecasts
- traffic operations and safety analysis
- corridor deficiencies analysis
- public, agency, and stakeholder involvement

The preliminary corridor improvement build alternatives were a corridor management alternative, an expressway alternative, and a connector route alternative. They are described briefly below, along with the No-Build Alternative.

Expressway Corridor

The expressway alternative would provide a direct, access-controlled connection between the Mariposa POE and I-19 at the Mariposa TI that follows the existing SR 189 alignment. Commercial truck and passenger vehicle traffic entering the U.S. through the Mariposa POE with destinations north of Nogales would travel by expressway to I-19. Traffic to the Mariposa International Commerce/Industry Park and other corridor activity centers would access the local street system via a collector-distributor frontage road system parallel to the expressway.

Connector Route Corridor

The connector route alternative would provide a direct access-controlled connection between SR 189 north of the Mariposa POE to I-19. The connection to I-19 would include improvements to the I-19/Western TI or a new system TI. Commercial truck and passenger vehicle traffic entering the U.S. through the Mariposa POE with destinations north of Nogales would travel the connector route to I-19. Traffic to the Mariposa International Commerce/Industry Park and other corridor activity centers would use the existing SR 189 corridor. This alternative would include improvements to the Mariposa TI.

Corridor Management

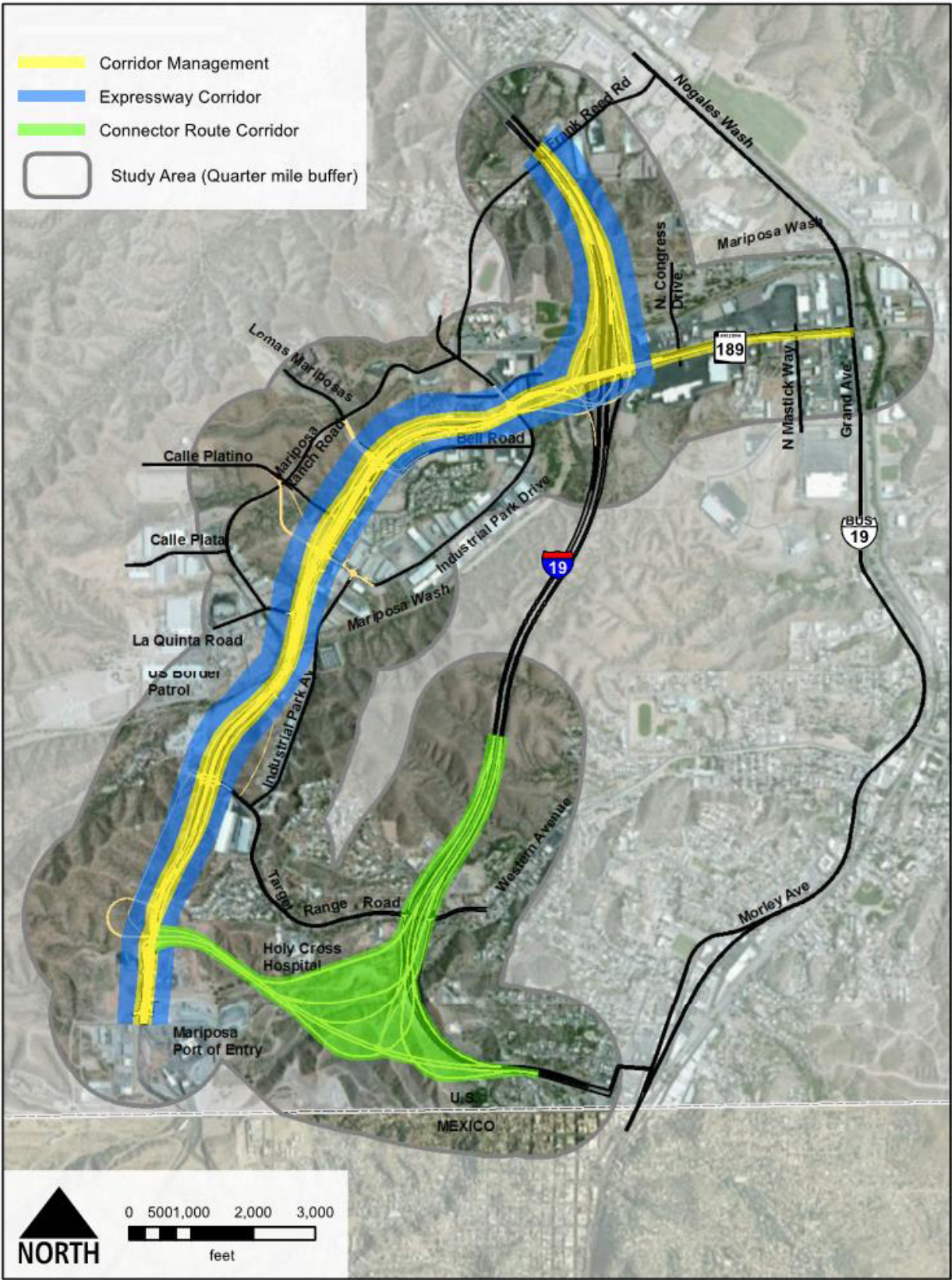
The corridor management alternative would improve traffic flow on existing SR 189 through intersection improvements and elimination or consolidation of existing driveways. Commercial and passenger vehicle traffic would continue to use the existing corridor for access to both I-19 and the industrial, commercial, and other activity centers in the corridor. This alternative would include improvements to the Mariposa TI.

No-Build Alternative

The No-Build Alternative assumes that no major improvements would be made to SR 189 or the Mariposa TI in the study area. Maintenance of the existing SR 189 and the Mariposa TI would continue. The No-Build Alternative serves as a baseline for comparing and evaluating the corridor build alternatives. This alternative provides a means to compare the impacts of the proposed action with the impacts of not undertaking the proposed action. It does not meet the purpose and need to implement improvements to the SR 189 corridor or the Mariposa TI.

Figure 3-2 shows the three corridor alternatives and the study area for the alternatives analysis.

Figure 3-2. SR 189 corridor alternatives and study area



### 3.1 Stage I Evaluation Criteria

Each of the three major corridor build alternatives includes upgrades and operational improvements to the Mariposa TI. A multidisciplinary set of criteria was used to evaluate each SR 189 corridor build alternative and the No-Build Alternative, which included the following performance measures:

- **Traffic Operations:** Travel time/travel speed on the corridor from the international border to the Mariposa TI and Grand Avenue would attain higher average travel speeds and LOS. Also included is an assessment of access consolidation, elimination or consolidation of driveways, and reduction of conflict points to reduce vehicle conflicts.
- **Implementation:** Opportunities and constraints for each corridor build alternative were measured by considering construction duration, construction phasing, potential roadway closures, and impacts on existing traffic. A corridor build alternative that minimizes these considerations was given a higher rating.
- **Environmental Impacts:** Potential natural, cultural, or human-made environmental resource areas were assessed to avoid, minimize, or mitigate potential adverse impacts for each corridor build alternative as part of the overall planning, design, and engineering phase of the proposed action.
- **Cost:** Relative SR 189 corridor and Mariposa TI construction costs were evaluated for new road, ramps, structures, new right-of-way (ROW), and associated improvements required for the corridor build alternatives.
- **Regional Plan Consistency:** Relationship of the corridor build alternatives with existing and planned transportation infrastructure and compatibility with adopted transportation plans, as described in Part II, Section C, *Conformance with Regulations, Land Use Plans, and Other Plans*, of the EA.
- **Public and Stakeholder Preference:** General expectations and preferences of the public, local municipalities, agencies, other public officials, and key stakeholders for each of the corridor build alternatives.

### 3.2 Stage I Evaluation

Each corridor alternative was given a rating for each criterion, resulting in a total combined score. Three build alternatives were evaluated. The No-Build Alternative was used as a baseline to score and compare the build alternatives. The build alternative with the highest score would be considered as the recommended preferred corridor alternative.

Under the traffic operations category, the expressway alternative scored the more favorable rating. The higher rating for this alternative is attributable to the combination of reduced travel times and the reduction of vehicle conflicts by providing one-way frontage roads and an access-controlled route to I-19.

The corridor management alternative proved to be the more favorable alternative under the implementation category. This alternative would have shorter construction durations because of spot intersection improvements, which, in turn, would provide immediate traffic operational benefits. Access management opportunities can also be prioritized by identifying the critical spot improvements locations.



The screening process did not indicate a major differentiator among the build alternatives (including the No-Build) under the environmental impacts category. At this preliminary stage, additional on-site evaluations would be necessary to provide a detailed assessment of the environmental impacts.

Under the cost category, the corridor management alternative scored the more favorable rating. When compared with the build and No-Build alternatives, the corridor management alternative had the lowest construction cost. This alternative was assumed to have the smallest footprint, which reduces the amount of new right-of-way required and reduces the possibility of full takes from residences and businesses.

Both the corridor management and the expressway alternative proved to be the more favorable alternatives under the regional plan consistency category. Both alternatives would support anticipated growth in local traffic in the area.

A summary of each alternative, based on its relative strength and weakness against the criteria, is presented in Table 3-1. A detailed matrix of the how each alternative was scored with supporting data is provided in Appendix E of this report.

Table 3-1. Stage I evaluation criteria and rating scale summary

Evaluation category		Corridor build alternatives				
		Corridor Management		Expressway		Connector Route
Traffic operations		<div><div></div></div>		<div><div></div></div>		<div><div></div></div>
Implementation		<div><div></div></div>		<div><div></div></div>		<div><div></div></div>
Environmental impacts		<div><div></div></div>		<div><div></div></div>		<div><div></div></div>
Cost		<div><div></div></div>		<div><div></div></div>		<div><div></div></div>
Regional plan consistency		<div><div></div></div>		<div><div></div></div>		<div><div></div></div>
Public and stakeholder preference		<div><div></div></div>		<div><div></div></div>		<div><div></div></div>
Rating guide						
Weakness	<div><div></div></div>	<div><div></div></div>	<div><div></div></div>	<div><div></div></div>	<div><div></div></div>	Strength

3.3 Stage I Preferred Corridor Alternative Recommendation

No-Build Alternative

As discussed previously, the No-Build Alternative serves as a baseline for comparing and evaluating the corridor build alternatives. This alternative allows comparison of the impacts of the proposed action with the impacts of not undertaking the proposed action, but it does not meet the purpose and need to implement improvements to the SR 189 corridor or the Mariposa TI.

Build Alternative

SR 189 Recommended Build Alternative

The corridor alternative screening process determined that the Corridor Management Alternative provides optimal implementation opportunities because it meets all elements of the purpose and need; has a much shorter construction duration; minimizes impacts on existing traffic, local businesses, and the environment; has the lowest construction cost; is most consistent with adopted local and regional transportation plans; and obtained the most support from stakeholders and the public. When comparing these benefits with the other alternatives, the corridor management alternative was identified as the Recommended Build Alternative.

In August 2014, ADOT and FHWA completed the process of screening the three corridor build alternatives. The result of this evaluation was consistent with public and stakeholder input on the recommended corridor alternative, and the Corridor Management Alternative was selected as the recommended build alternative, thus completing the Stage I evaluation of the corridor alternatives (see Figure 3-1). It will be the basis for evaluating and assessing potential impacts in the EA, along with the No-Build Alternative.

The corridor management portion of the Recommended Build Alternative between the Mariposa POE and Grand Avenue, with a length of approximately 3.7 miles, includes the following improvements:

- Build or modify exit and entrance ramps connecting SR 189 to northbound and southbound I-19, build a new multispan bridge over the Frank Reed Road intersection at SR 189 and/or I-19, widen I-19 to add northbound and southbound lanes connecting entrance and exit ramps between Frank Reed Road and SR 189, install retaining walls adjacent to the I-19 freeway entrance and exit ramps as needed, and install retaining walls adjacent to the SR 189 entrance and exit ramps as needed.
- Implement spot intersection improvements at the intersections of SR 189 with Target Range Road, La Quinta Road, Loma Mariposa Road, and Frank Reed Road, which will include, but not be limited to, roadway widening, drainage improvements, traffic signals, pavement marking, signs, and lighting.
- Widen SR 189 between I-19 and Grand Avenue to provide additional through lanes and right-turn bays.
- Widen the SR 189 main line corridor roadway, with new travel lanes and medians.
- Eliminate various existing driveways (to be determined) to control access along SR 189.
- Make drainage improvements along SR 189 to include inlets, pipes, culverts, basins, and related improvements.

- Implement additional traffic signalization (to be determined), pavement markings, signs, and roadway lighting at the proposed ramps, TI areas, and SR 189 corridor.
- Implement access management strategies along SR 189.

The Corridor Management Alternative is being further evaluated and assessed based on public, agency, and stakeholder input as well as environmental impact evaluation, design, engineering, and traffic modeling to further develop and refine the most efficient design.

3.4 Mariposa TI Options Considered

After the Recommended Build Alternative was selected, the six Mariposa TI options were developed and evaluated as part of the Stage II screening evaluation (see Figure 3-1). The proposed improvements associated with the Mariposa TI coincide with the improvements identified for the Corridor Management Alternative as part of the overall improvements under the Recommended Build Alternative. The Mariposa TI options were evaluated as independent options as part of the Recommended Build Alternative because FHWA requires a separate analysis when a proposed roadway project involves any changes in access that involves the U.S. Interstate Highway System.

The six TI options evaluated for the alternatives analysis are presented in Table 3-2.

Table 3-2. Stage II Mariposa TI options

Option	Description
A	Diamond with flyover
B	Diamond with flyover and southeast quadrant loop ramp
C	Diamond with inside flyover
D	Diamond with inside flyover and grade separation at Frank Reed Road
E	Single point urban interchange (SPUI)
F	Diverging diamond interchange (DDI)

The following is a detailed description of each of the six TI options being considered.

Option A – Diamond with Flyover



Option A consists of a flyover ramp from eastbound SR 189 to northbound I-19. The flyover is a two-lane ramp that merges into one lane before entering northbound I-19. The entrance to the flyover is east of the Frank Reed Road and SR 189 intersection. The entrance to northbound I-19 from the flyover ramp is north of the existing northbound I-19 entrance ramp. The entrance and exit ramp merges/diverge movements occur on the outside. Improvement along SR 189 includes widening in the eastbound direction west of the Mariposa TI to add a third through lane. Reconstruction or widening of the Mariposa Wash bridge structure would accommodate the flyover bridge structure.

Option B – Diamond with Flyover and Southeast Quadrant Loop Ramp



Option B consists of a flyover ramp from eastbound SR 189 to northbound I-19. The flyover is a two-lane ramp that merges into one lane before entering northbound I-19. The entrance to the flyover is east of the Frank Reed Road and SR 189 intersection. The entrance to northbound I-19 from the flyover ramp is north of the existing northbound I-19 on-ramp. The entrance and exit ramp merges occur on the outside. This option would modify the southbound I-19 exit and entrance ramps. The southbound I-19 ramp/crossroad intersection is reconstructed west of the existing location. Reconstruction of the intersection allows room for the loop ramp, which would allow vehicles to avoid the left-turn movement to head east on SR 189. Improvement along SR 189 includes widening in the eastbound and westbound direction east and west of the Mariposa TI to add a third through lane. Reconstruction or widening of the Mariposa Wash bridge structure would accommodate the flyover bridge structure.



### Option C – Diamond with Inside Flyover



Option C consists of a flyover ramp from eastbound SR 189 to northbound I-19. The flyover is a one-lane ramp entering northbound I-19. The entrance to the flyover is east of the Frank Reed Road and SR 189 intersection. The entrance to northbound I-19 from the flyover ramp is in the median of northbound I-19. The entrance and exit ramp merge/diverge movements occur on the inside. Improvement along SR 189 includes widening west of the Mariposa TI to accommodate the flyover structure. Reconstruction or widening of the Mariposa Wash bridge structure would accommodate the flyover bridge structure.

### Option D – Diamond with Inside Flyover and Grade Separation at Frank Reed Road



Option D consists of a flyover ramp from eastbound SR 189 to northbound I-19 and also from southbound I-19 to westbound SR 189. The flyover is a one-lane directional ramp in each direction entering and exiting I-19. The flyover entrance and exit is west of the Frank Reed Road and SR 189 intersection. At the Frank Reed Road intersection, the flyover ramp will be grade separated from the intersection. The entrance and exit to I-19 from the flyover ramp is in the median north of the Mariposa TI. The entrance and exit ramp merge/diverge movements occur on the inside. Improvement along SR 189 includes widening west of the Mariposa TI to accommodate the flyover structure. Reconstruction or widening of the Mariposa Wash bridge structure would accommodate the flyover bridge structure.

### Option E – Single Point Urban Interchange



Option E consists of shifting the ramp/crossroad intersections toward the center of the TI. The existing I-19 bridges are two-span. Going with this option would require reconstruction of the I-19 bridge to a one-span structure. Due to the increased span, the bridge structure depth would also be increased and the I-19 profile would need to be raised to accommodate the change in vertical clearance. Widening of the Mariposa Wash bridge may be required to accommodate the SPUI configuration.

### Option F – Diverging Diamond Interchange



This option's diamond interchange moves the cross street traffic to the left side of the roadway between the signalized ramp intersections. The left-turn signal phase at the ramp terminals is eliminated. Vehicles on the cross street wanting to turn left are allowed to continue to the ramps without conflicting with opposing through traffic and without stopping. DDIs appear to be most applicable where there are heavy left turns onto the ramps or moderate to heavy left turns from the ramps (ADOT 2012). Improvement along SR 189 includes widening west and east of the Mariposa TI to accommodate the DDI configuration. Reconstruction of the bridge over Mariposa Wash is also required to accommodate the DDI configuration.

3.5 Stage II Evaluation Criteria

A multidisciplinary set of criteria was used to evaluate the TI alternative type. Performance of each alternative was determined with respect to:

- **Traffic Operations:** Intersection LOS along the SR 189 corridor. Higher LOS indicates better performance. Ramp intersection LOS at the TI. Higher LOS indicates better performance.
- **Pedestrian and Bicycle Travel:** Assessment of pedestrian and bicycle circulation through the TI. Minimal restrictions to pedestrian and bicycle circulation indicate better performance. Average intersection delay in the corridor. Lower average intersection delay indicates better performance.
- **Route Continuity:** Assessment of how vehicles can continue on I-19 through the proposed TI. The ability for vehicles to continue on I-19 or reverse direction through the TI option indicates better performance.
- **Environmental Impacts:** Potential environmental elements that may need to be addressed in design.
- **Cost:** Assessment of the locations and types of structures required to support the TI option. A reduction in the amount of bridge required indicates a higher rating. Assessment of the locations and types of structures required to support the TI option. A reduction in the amount of retaining walls required indicates a higher rating. Assessment of the amount of new right-of-way required for the TI options. Options that require the least amount of new right-of-way indicate a higher rating.
- **Implementation:** Assessment of the implementation opportunities and constraints for each TI option would be measured by how the option can be phased to provide shorter construction durations. Assessment of the implementation opportunities and constraints for each TI option would be measured by considering impacts to adjacent businesses resulting from potential roadway closures and impacts on existing traffic.
- **Design Considerations:** Assessment of profile grades for ramps. A grade of 3 percent or less is desirable. Assessment of general expectations of the public for the corridor. Assumes that drivers are anticipating a standard diamond TI that is consistent with most TIs in the corridor. Assessment of weaving distance from the Frank Reed Road and SR 189 intersection to the I-19 entrance ramps. Desirable weaving distance is 1,000 feet.
- **Stakeholder and Public Input:** Preference of TI option based on outreach efforts and the November 2014 meeting that allowed members of the public to provide input on the TI options. The stakeholder and public input will be documented in the EA. Stakeholder meetings have been held with Santa Cruz County, City of Nogales, Nogales Unified School District, Fresh Produce Association of the Americas, Holy Cross Hospital, Nogales-Santa Cruz County Chamber of Commerce, Trucking Industry, Port Authority Board, and Pima Association of Governments.

3.6 Stage II Evaluation

Each of the three major improvement alternative types includes upgrades to the Mariposa TI. The second stage of screening evaluated the Mariposa TI options. The Stage II selection process identified the preferred TI concept to support the overall corridor improvement. Each TI option was evaluated and scored based on the criteria

established for Stage II. The evaluation process is described in a narrative format with tables showing the scoring results.

Stage II Traffic Operation Analysis

Based on the series of roadway intersection and TI options, a traffic operations analysis was conducted for corridor segments and intersections to identify operational deficiencies for 2040.

Much of the forecast 2040 corridor congestion is a result of passenger vehicles and trucks waiting to turn left from eastbound SR 189 onto I-19 northbound. Reconfiguration of the Mariposa TI will be required to accommodate long-range traffic growth. For the Stage II evaluation, six Mariposa TI options were incorporated into the traffic operations analysis to evaluate the performance of each option at the system-wide level, at the TI level, and at the intersection level. The system-wide performance measures are based on the entire model network and include all of the vehicles traveling on the arterials. The limits of the system that was evaluated extended from Freeport Drive to Grand Avenue along SR 189.

Notable Observations and Initial Recommendations

The VISSIM analysis indicated that growth in truck and passenger vehicle border crossings at the Mariposa LPOE and growth in traffic from development in the Mariposa International Commerce/Industrial Park and the Centro Commercial district will cause traffic operations at key intersections to deteriorate through the 2040 planning horizon.

Mariposa TI

Much of the forecast 2040 corridor congestion is a result of passenger vehicles and trucks waiting to turn left from eastbound SR 189 onto I-19 northbound. While ADOT has implemented a dual eastbound left-turn lane, modified the northbound ramp, and improved traffic signal timing at the Mariposa TI, reconfiguration of the TI will be required to accommodate long-range traffic growth. Initial VISSIM modeling indicates that reducing the delays at the TI will improve overall corridor traffic operations.

International Border to I-19

With the exception of the southbound left turn from Frank Reed Road and the southbound left turn from the I-19 southbound off-ramp, the delays to other signal-controlled movements result from long signal cycle lengths and limited green time allocation to the specified movements. Additional lane capacity would not notably improve delay times. Construction of a dual southbound left-turn lane on Frank Reed Road would improve delays to this movement. Additionally, it would provide more storage, minimizing the potential blockage of driveways by the southbound left-turn queue. The Mastick Way intersection could benefit from additional eastbound right-turn lane storage.

I-19 to Grand Avenue

Improvements to the Mariposa TI will increase congestion at the Mariposa Road and Grand Avenue intersection. Improvements at the SR 189 and Grand Avenue/B-19 intersection include southbound left-turn lanes and right-turn lanes.



VISSIM Traffic Simulation Analysis

VISSIM traffic simulation analysis shows that if congestion at key intersections can be addressed, the existing five-lane cross-section with two travel lanes in each direction and a center two-way left-turn lane can accommodate 2040 traffic at an acceptable LOS. For the evaluation of the six TI options, the VISSIM model was modified to include the Forecast Year 2040 conditions to predict anticipated levels of delay and intersection performance with the roadway geometry. The VISSIM analysis conducted for the Stage II analysis was used to compare the six TI options. With the selection of the TI options identified for further study, additional refinement of the VISSIM model will be required before moving forward. The results of the VISSIM analyses for the recommended build option will be documented in the traffic operations analysis report.

Summary of Segment Performance

The segment performance evaluation indicates that Option D (Diamond with Inside Flyover and Grade Separation at Frank Reed Road) has the shortest travel times out of the six TI options. Option D allows LPOE traffic to avoid the Frank Reed Road intersection. This reduces the volume of conflicting traffic traveling through the Frank Reed Road intersection and provides smoother progression and shorter queues through the Mariposa TI. There is one notable location of congestion for Option D, where the off-ramp from I-19 southbound merges onto SR 189 westbound in proximity to the signalized Loma Mariposa Road intersection. At this location, merging can be difficult during periods of heavy traffic.

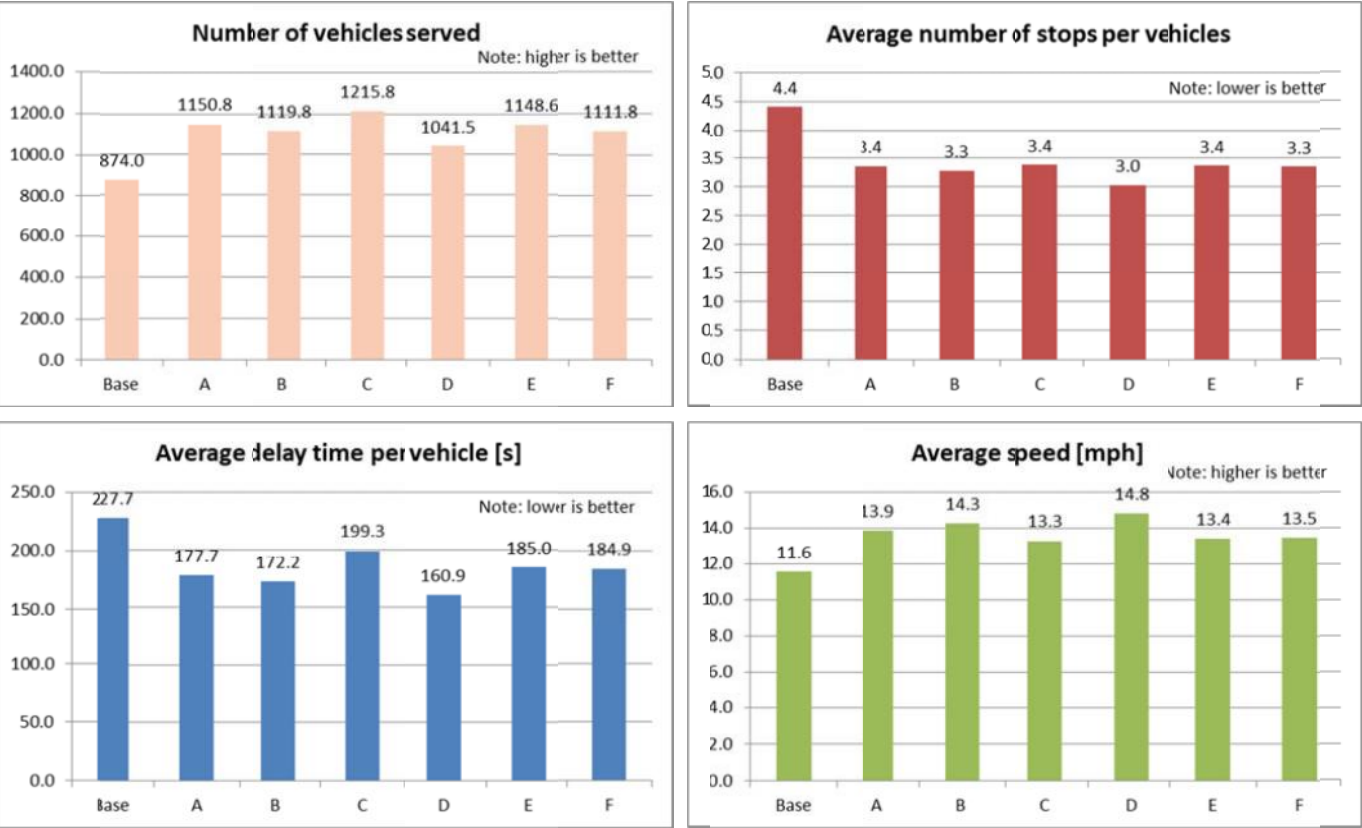
Summary of System-wide Network Performance

The system-wide measurements, including average delay, average speed, average stops, and vehicles served, are summarized in Figure 3-3. Notable observations regarding the system-wide measurements include:

- TI Options A, B, and D consistently performs near the best among all of the options.
- TI Options C, E, and F consistently perform near the worst among all of the options.

The range of vehicles served by the TI options is from 1,041 to 1,215, which is a gap of 174 vehicles, or 17 percent of the total vehicles. Option D had the lowest number of vehicles served because of a location where extreme congestion was observed. The location is just east of the Loma Mariposa Road intersection, where the off-ramp from I-19 southbound merges onto SR 189 westbound in proximity to the signalized Loma Mariposa Road intersection. Merging will be difficult during periods of heavy traffic since the westbound queue at Loma Mariposa Road often extends beyond the southbound off-ramp merge point.

Figure 3-3. Performance of Mariposa TI options



Evaluation of TI Options

Option B required the most ROW and entailed the most impacts on local businesses of all the TI options. This option also introduced additional bridge structures, which would increase costs and construction durations. Option B performed much like Option A in the traffic operations category. When comparing these two options, Option A involved less ROW, less cost, and shorter construction durations. Therefore, Option B was eliminated based on these factors.

Option C did not perform well under the traffic operation criteria for ramps, intersections, travel time, or driver expectancy. Option C did not perform well under any of the design considerations, including profiles grades that exceeded 5 percent. With the high volume of heavy trucks that would be using this corridor, the steep grades would not be beneficial to the corridor. Option C also scored poorly on driver expectancy or weaving distance requirements. Based on these factors, Option C was eliminated from further study.



Options E and F both exhibited significant vehicle queues between Frank Reed Road and the TI for the future 2040 traffic volumes. This queuing would adversely affect the Frank Reed Road intersection LOS. In the traffic operations category, both Options E and F performed the worst among the TI options. Both options would also require longer construction durations and greater impacts on local businesses. For these reasons, Options E and F were eliminated from further study.

When comparing the rating criteria, performance indicators, and benefits among the Mariposa TI options, the top performing TI options were:

Option A – Diamond with Flyover

Option D – Diamond with Inside Flyover and Grade Separation at Frank Reed Road

Option A demonstrated a reasonable performance for each of the evaluation criteria, especially with regard to providing acceptable traffic operation performance levels, lower cost, and shorter construction durations. In addition, Option A minimizes impacts on existing traffic, provides route continuity, and meets drivers’ expectancy, which relates to drivers’ readiness to respond to situations, events, and information in predictable and successful ways. Option A also would have the least impact on local businesses and the environment in general.

The high rating for Option D is mainly attributable to its superior level of traffic operations performance between the Mariposa TI entrance and exit ramps and Frank Reed Road. Option D demonstrated the most significant decrease in travel times, at 15 percent, or approximately 1 to 2 minutes in travel time savings when compared with Option A. Reducing travel times and intersection delays has the benefit of lowering the operational cost for vehicles and businesses using the corridor. Option D also scored high with regard to design considerations, with ramp grades at 3 percent and good weaving distances.

Based on the technical criteria used for the TI screening process and input and support from stakeholders, Option D was selected for further study and analysis as part of the Mariposa TI portion of the Recommended Build Alternative.

A summary of each TI option, based on its relative strength and weakness against the criteria, is presented in Table 3-3. A detailed matrix of how each option was scored for the Stage II evaluation is provided in Appendix F of this report.

Table 3-3. Stage II evaluation criteria and rating scale summary

Evaluation category	TI Option					
	A	B	C	D	E	F
Traffic operations						
Pedestrian and bicycle travel						
Route continuity						
Environmental Impacts						
Cost						
Implementation						
Design considerations						
Public and stakeholder preference						
Rating guide						
Weakness						Strength

3.7 Stakeholder and Public Outreach

The preliminary corridor alternatives have been presented to the public and stakeholders through many outreach activities, starting with the May 2012 agency scoping meeting and continuing with stakeholders' meetings in June and September of 2011 and April 2012; a public meeting in May 2012; and stakeholder meetings with area property owners and business interests in June 2012. On August 15, 2012, the City of Nogales passed a resolution supporting and encouraging the selection of the Corridor Management alternative, along with dismissal of the Expressway and Connector Route alternatives. On the same day, the Board of Supervisors of Santa Cruz County voiced similar support for the Corridor Management alternative and dismissal of the Expressway and Connector Route alternatives. The outreach activities resulted in the Corridor Management alternative receiving the most support from the public and stakeholders. Appendix C provides a summary of stakeholder and public comments.

The corridor improvement ideas were presented in the *SR 189 Alternatives Summary Matrix* (ADOT 2013a) and included the Corridor Management alternative, an Expressway alternative, and a Connector Route alternative. In August 2014, ADOT and FHWA completed the process of screening the three corridor alternatives. The result of this evaluation was consistent with the public and stakeholder input on the recommended corridor alternative. The Corridor Management alternative will be considered as the recommended preferred corridor alternative, as well as the No-Build alternative.

Stakeholder Outreach

A series of meetings were scheduled with selected stakeholders to provide current project information on various options and project schedule and to hear their concerns and answer questions prior to the public meeting. The stakeholders provided comments and recommendations for the corridor management alternative and the Mariposa TI options. For the purpose of this report, only comments and recommendations related to the Mariposa TI are presented. Any comments and/or recommendations related to the Corridor Management alternative will be documented and considered in the DCR as the recommended build alternative gets refined.

Based on feedback received at the stakeholder meetings, notable comments that have been documented are as follows:

- The City of Nogales inquired about provisions for southbound frontage roads along I-19. Each TI option can be evaluated to accommodate future frontage roads. Further discussion will be required to ensure that there are future plans to construct a frontage road system along I-19.
- The Nogales-Santa Cruz County Chamber of Commerce expressed concerns regarding Frank Reed Road due to the high school near the intersection. The organization prefers a grade separation at Frank Reed Road and has a preference for Option D.
- The trucking industry has identified eastbound SR 189 to northbound I-19 as the critical movement. It has a preference for Option D and a lesser preference for Option C.
- The Port Authority Board indicated a preference for Options A and D, or a hybrid of the two.

Public Outreach

ADOT and FHWA held a public meeting on November 18, 2014, to seek input on the six TI options. The stakeholder and public input received at the public meeting was used in the evaluation of the TI options (Table 3-4). ADOT provided a summary of the public comments received during the comment period. This screening document incorporates the comments classified under the “Traffic Interchange Ramp Option Alternatives” category. The following table summarizes the comments received for each TI option.

Table 3-4. Comments received regarding the Mariposa TI options

Option	Number of comments received
A – Diamond with Flyover	2
B – Diamond with Flyover and Southeast Quadrant Loop Ramp	2
C – Diamond with Inside Flyover	0
D – Diamond with Inside Flyover and Grade Separation at Frank Reed Road	1
E – Single Point Urban Interchange	1
F – Diverging Diamond Interchange	2

Based on the feedback received at the public meeting, notable comments that have been documented are as follows:

- Option A was noted as being the best option for the increase in the trucking industry.
- Feedback received for Option B indicated that this option will address traffic exiting and entering I-19 and will be safer for produce trucks.
- Support for Option C was also observed along with a recommendation for related improvements at the existing Frank Reed Road underpass at I-19.
- Option D was noted as an option that will reduce congestion, eliminate the mix of pedestrian and vehicle conflicts, and reduce the mix of commercial and inexperienced drivers at Frank Reed Road.
- Feedback received for Option F indicated that this option appears to be the best improvement versus cost option.

In general, based on the public meeting summary, opposition to any of the TI options was not apparent. The overall consensus from the public feedback was that public and stakeholders support implementing a new TI solution. In summary, based on stakeholder support and its evaluation rating during the TI screening process, the study team identified Option D as the Recommended Build Alternative.

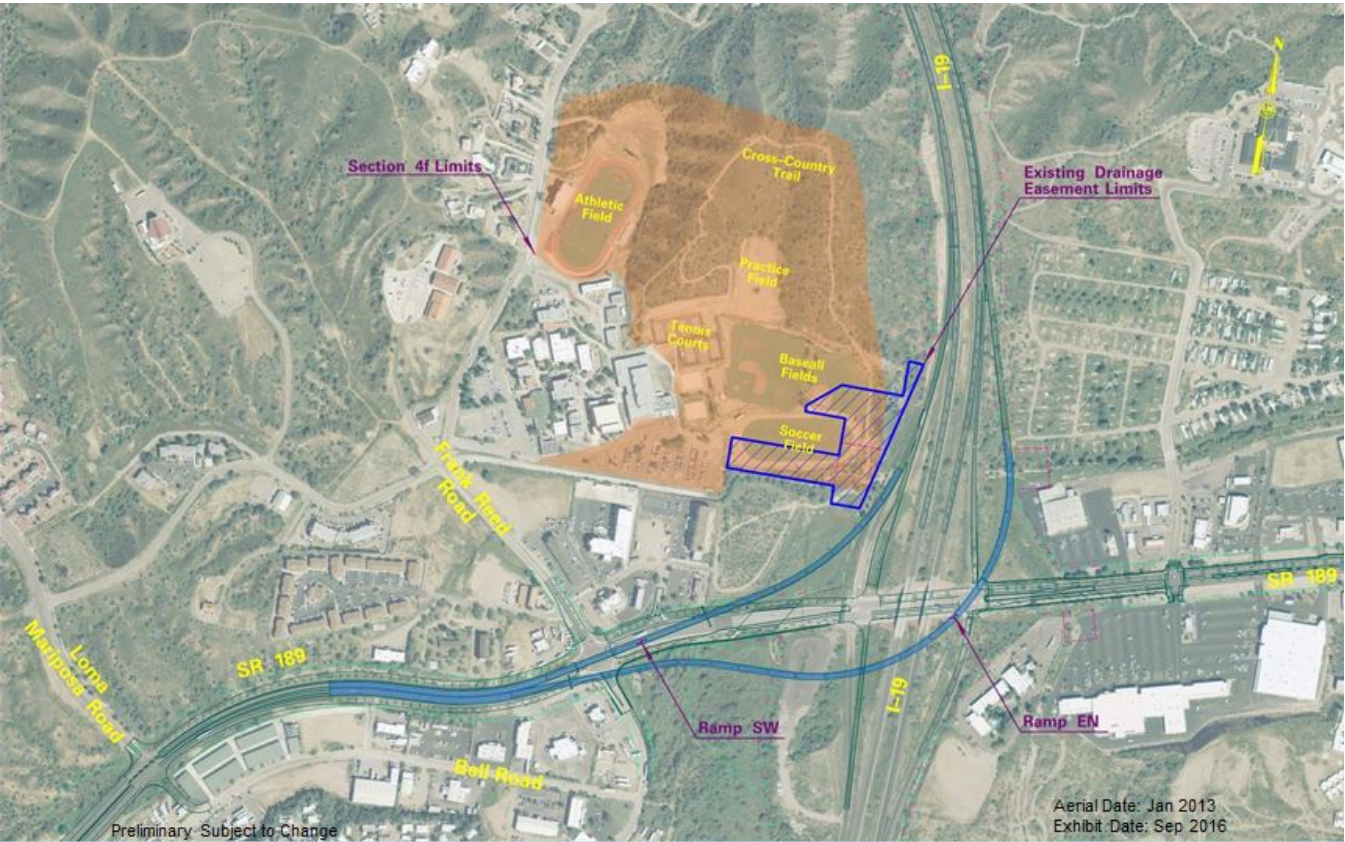
3.8 Refinement of Option D to Incorporate Right-Hand Versus Left-Hand Exit and Entrance Ramps Along I-19

Option D as presented in the previous sections incorporates a left-hand merge for vehicles entering northbound I-19 and a left-hand exit for vehicles exiting SB I-19. Driver expectancy for the left-hand exit and entrance was a concern during the study process. An evaluation was conducted to revise the ramp geometry to eliminate this



issue and provide a typical right-hand exit or entrance to I-19. Various configurations were developed and presented to the agencies and stakeholders. The Recommended Build Alternative that incorporates the study team’s input is presented in the next chapter. The figure that was presented to stakeholders with the refinements is shown in Figure 3-4. The design concept shown in the figure was selected to provide driver expectancy and maneuverability for large freight trucks using the exit and entry ramps at I-19. Other factors included less ROW and accessibility impacts on adjacent properties and reduced cost when compared to the original configurations due to increased structural cost. Additional information can also be found in the SR 189 Environmental Assessment report.

**Figure 3-4.** Refinements presented to stakeholders



**3.9 Stage II Preferred TI Option Recommendation**

Throughout the Mariposa TI analysis process, Option D was considered the best-performing TI option with respect to traffic operations. However, ADOT has only \$65 million currently allocated for the SR 189 improvements in FY 2019. The cost of implementing Option D is estimated in the range of \$134 million, which exceeds the funds currently allocated for improvements along the SR 189 corridor and at the Mariposa TI. Based on the preliminary estimates, this equates to a \$69 million funding shortfall. The study team and key stakeholders developed and agreed on a long-term strategy to implement the improvements needed for the SR 189 corridor to

meet the purpose and need of this proposed action. The strategy is based on planning and developing an interim and ultimate configuration solution for the Mariposa TI.

Based on the planned funding identified in FY 2019, in order for a build alternative to be developed that incorporates the key features of Options A and D, an alternative was developed that could be constructed in phases. A hybrid of Options A and D was developed to allow Option A to be developed initially. A future phase will incorporate the key features of Option D. The key features of Option D include grade separation of the flyover ramps over the Frank Reed Road intersection. Option D by itself could not be constructed in phases because it had to be constructed entirely to be operational. A split ramp concept allowed Option A to be constructed for the interim phase. The ultimate phase will construct the south-to-west flyover ramp, while the east-to-north flyover ramp could remain open. Upon completion of the south-to-west flyover ramp, the east-to-north flyover ramp could be modified to provide grade separation at Frank Reed Road.

Option A has been put forth as an interim configuration solution because it can be implemented with the funding currently allocated in ADOT’s Five-Year Transportation Facilities Construction Program. The interim solution will be constructed first at the Mariposa TI because it can be built with the current funding. The interim configuration improvements consist of an outside flyover ramp from eastbound SR 189 to northbound I-19. The flyover will be a one-lane ramp as it enters northbound I-19. The entrance to the flyover will be just east of the SR 189/Frank Reed Road intersection. The entrance to northbound I-19 from the flyover ramp will be north of the existing northbound I-19 entrance ramps. The entrance and exit ramp merges/diverge movements will occur on the outside of the northbound lanes. The TI improvements on SR 189 include widening in the eastbound direction west of the Mariposa TI to add a third through lane. Reconstruction or widening of the Mariposa Wash bridge structure will accommodate the flyover bridge structure.

The ultimate configuration solution closely emulates Option D and will be built at the Mariposa TI after the interim TI improvements are completed, if additional funds become available in the near future. The ultimate configuration improvements consist of a flyover ramp from eastbound SR 189 to northbound I-19 and from southbound I-19 to westbound SR 189. The flyover will be a one-lane directional ramp in each direction entering and exiting I-19. The flyover entrance and exit will be west of the SR 189/Frank Reed Road intersection on the inside of SR 189. At the Frank Reed Road intersection, the flyover ramp will be grade-separated from the existing intersection. The entrance and exit to I-19 from the flyover ramp will be on the outside north of the Mariposa TI.

The entrance and exit ramp merge/diverge movements will occur on the outside of the existing I-19 traffic lanes. Improvements along SR 189 will include widening west of the Mariposa TI to accommodate the flyover structure. Reconstruction or widening of the Mariposa Wash bridge structure will accommodate the flyover bridge structure. The interim and ultimate Mariposa TI configuration is presented in Figures 3-5 and 3-6.



Figure 3-5. Mariposa TI interim condition

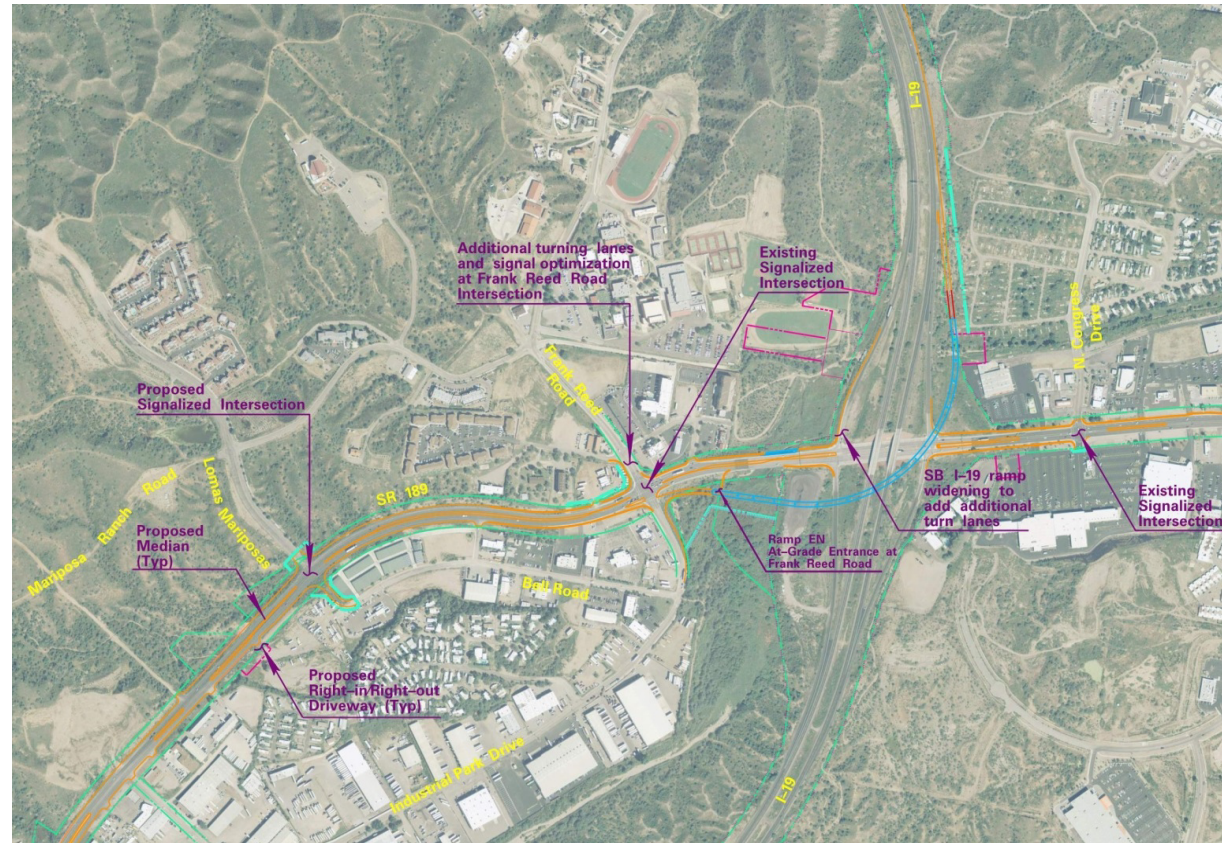
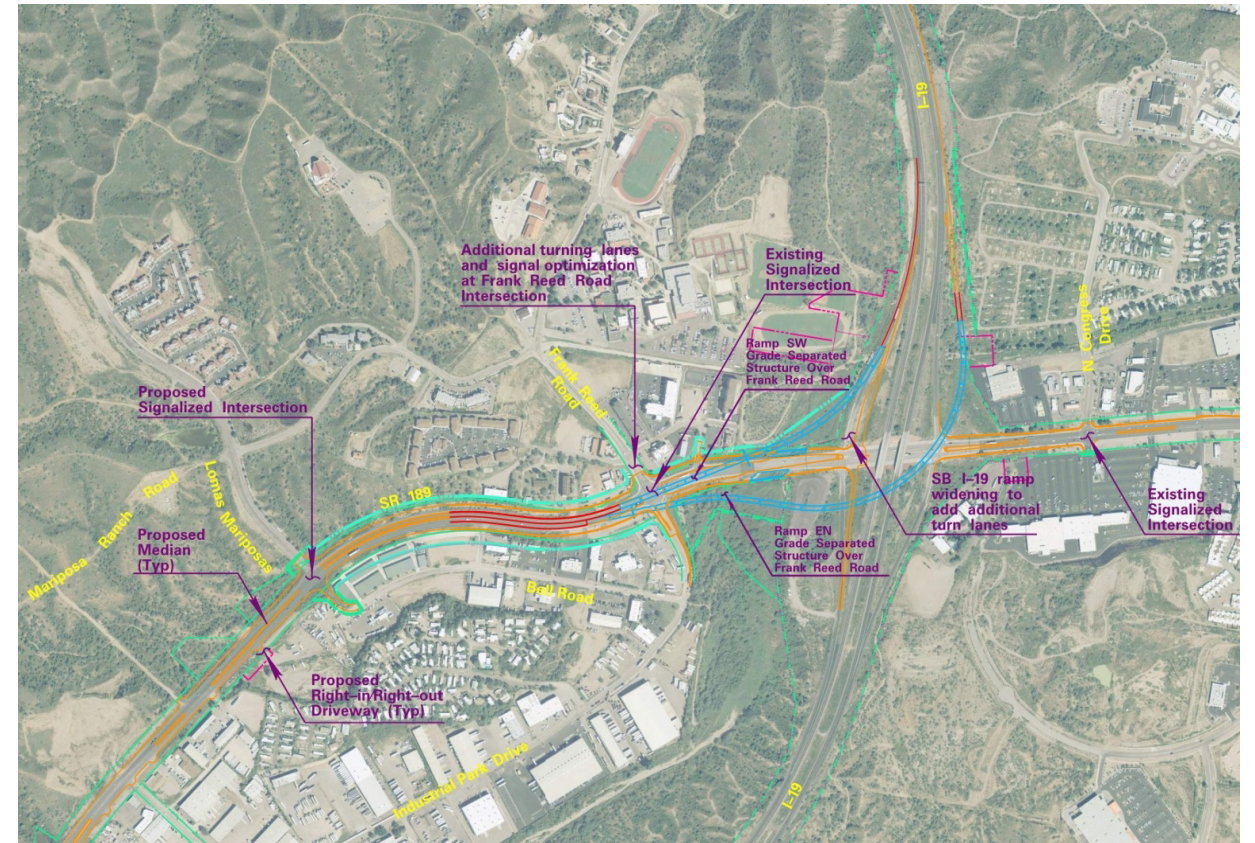


Figure 3-6. Mariposa TI ultimate condition





3.10 Intersection Options for the Target Range Road Intersection

During the study process, various local stakeholders, agencies and technical groups had input on what the recommended solution should be at the Target Range Road intersection. The current profile grade along SR 189 is approximately 4.5%. The west leg of the intersection is for private access to a trucking facility. The east leg of the intersection is Target Range Road. Three options were developed for intersection that met the needs of the area and provided acceptable LOS at the intersection.

- Traffic Signal – Traffic operations consists of signals controlling all phases of movement through the intersection.
- Roundabout – A configuration that contains no traffic signals or stop signs. Drivers will yield to traffic in the roundabout and exit to their desired street.
- Median U-Turn – This configuration eliminates the left-turns from both the minor and major approaches at the main intersection. Left-turns are executed away from the main intersection via U-turns at the median opening downstream of the intersection.

Based on the traffic analysis for each of the three intersection options, the roundabout provided the best overall levels of service for the intersection. While delays for Target Range Road increased under the roundabout alternative, the delays for SR 189 decreased enough to offset this and to lower the overall average intersection delay (Wilson & Co. 2016). The traffic performance of each intersection option is presented in Figure 3-7.

Figure 3-7. Traffic Signal at Target Range Road Intersection

SR 189 & Target Range Road Intersection Mid-Day Peak Performance																			
Approach	Movement	Signalized						Roundabout						Indirect Left					
		Intersection Delay	Intersection LOS	Approach Delay	Approach LOS	Movement Delay	Movement LOS	Intersection Delay	Intersection LOS	Approach Delay	Approach LOS	Movement Delay	Movement LOS	Intersection Delay	Intersection LOS	Approach Delay	Approach LOS	Movement Delay	Movement LOS
WB	Right	32	C	43	D	32	C	31	C	96	F	15	B	39	D	86	F	59	E
	Through																		
	Left					49	D					144	F					101	F
SB	Right			45	D	44	D			36	D	11	B			36	D	28	C
	Through					45	D					38	D					32	C
	Left					44	D					44	D					74	E
NB	Right			21	C	11	B			13	B	3	A			24	C	15	B
	Through					21	C					13	B					20	B
	Left					32	C					19	B					59	E
EB	Right	15	B	15	B	7	A	1	A	65	E	60	E						
	Through			18	B			36	D			97	F						
	Left			24	C			34	C			108	F						

Source: Year 2040 Traffic Operations Analysis Report, February 2016, by Wilson & Co.

In September 2016, the intersection options were presented to the local stakeholders in Nogales, AZ. Table 3-5 compares the intersection options with evaluation criteria that were presented to the stakeholders.

Table 3-5. SR 189 and Target Range Road Intersection Comparison

Evaluation Criteria	Target Range Road Intersection Configuration		
	Traffic Signal	Roundabout	Median U-Turn
Traffic Operations	Good	Better	Best
Safety (Number of Conflicts)	Good	Best	Better
Access Management	Good	Better	Best
Intersection Access	Better	Best	Good
ROW	Best	Good	Better
Long-term Cost	Good	Better	Best
Capital Cost	Best	Good	Better
Adaptability	Better	Good	Best

After the presentation, majority of the stakeholders supported the roundabout option. The three intersection options are presented in Figures 3-8, 3-9, and 3-10.

Figure 3-8. Traffic Signal at Target Range Road Intersection



**Figure 3-9.** Roundabout at Target Range Road Intersection



**Figure 3-10.** Median U-Turn at Target Range Road Intersection





4.0 Major Design Features of the Recommended Build Alternative

This section describes the design controls and design features for the Recommended Build Alternative for SR 189, I-19, and the Mariposa TI improvements within the study limits. The Recommended Build Alternative’s major design features are depicted in Figure 4-1 (interim) and Figure 4-2 (ultimate) and are described in detail in the following sections.

4.1 Design Criteria

The notable design criteria for SR 189, service TI ramps, crossroads, and directional ramps are presented in Table 4-1.

Table 4-1. Design controls for proposed project elements

Item description	Design control
SR 189	
Design year	2040
Design vehicle	WB-67
Design speed	45 mph
Superelevation	Match existing (0.06 foot/foot maximum)
Cross slope	Match existing (2.0%)
Lane width	12 feet
Shoulder width (median and outside)	12 feet
Maximum horizontal curve	3 degrees, 27 minutes
Maximum gradient	3%
Taper rate	50:1
Slope standards (cut and fill slopes)	Varies, 3:1 maximum
Minimum vertical clearance (highway structure)	16 feet, 6 inches
Service TI ramps	
Design year	2040
Design vehicle	WB-67
Design speed for nose of gore (exit ramps)	60 mph
Design speed for nose of gore (entrance ramps)	55 mph
Design speed for ramp body	50 mph
Design speed for ramp terminal	35 mph
Superelevation	0.06 foot/foot maximum

Table 4-1. Design controls for proposed project elements

Item description	Design control
Lane width	12 feet
Pavement width (exit ramp)	22 feet, plus 2 feet offset to barrier
Pavement width (entrance ramp)	22 feet, plus 2 feet offset to barrier
Maximum horizontal curve	6 degree, 53 minutes
Maximum gradient	+4.0%, –5.0%
Slope standards (cut and fill slopes)	Varies, 3:1 maximum
Crossroads	
Design year	2040
Design vehicle	WB-67
Design speed	45 mph
Superelevation	Normal crown
Cross slope	2%
Lane width (adjacent to raised median)	14 feet
Lane width (without curb)	12 feet
Lane width (outside lane with curb)	14 feet
Maximum horizontal curve	6 degree, 53 minutes
Maximum gradient	+4.0%, –5.0%
Taper rate	45:1
Slope standards (cut and fill slopes)	Varies, 3:1 maximum
Minimum vertical clearance (highway structure)	16 feet, 6 inches
Directional ramps	
Design year	2040
Design vehicle	WB-67
Design speed	55 mph (main body); 65 mph (at main line exit)
Superelevation	0.06 foot/foot (maximum)
Road width	28 feet (32 feet with barrier) (one-lane ramps)
Lane width	12 feet
Maximum horizontal curve	5 degrees, 15 minutes
Maximum gradient	4% upgrade; 5% downgrade
Taper rate	65:1



Figure 4-1. Interim Condition

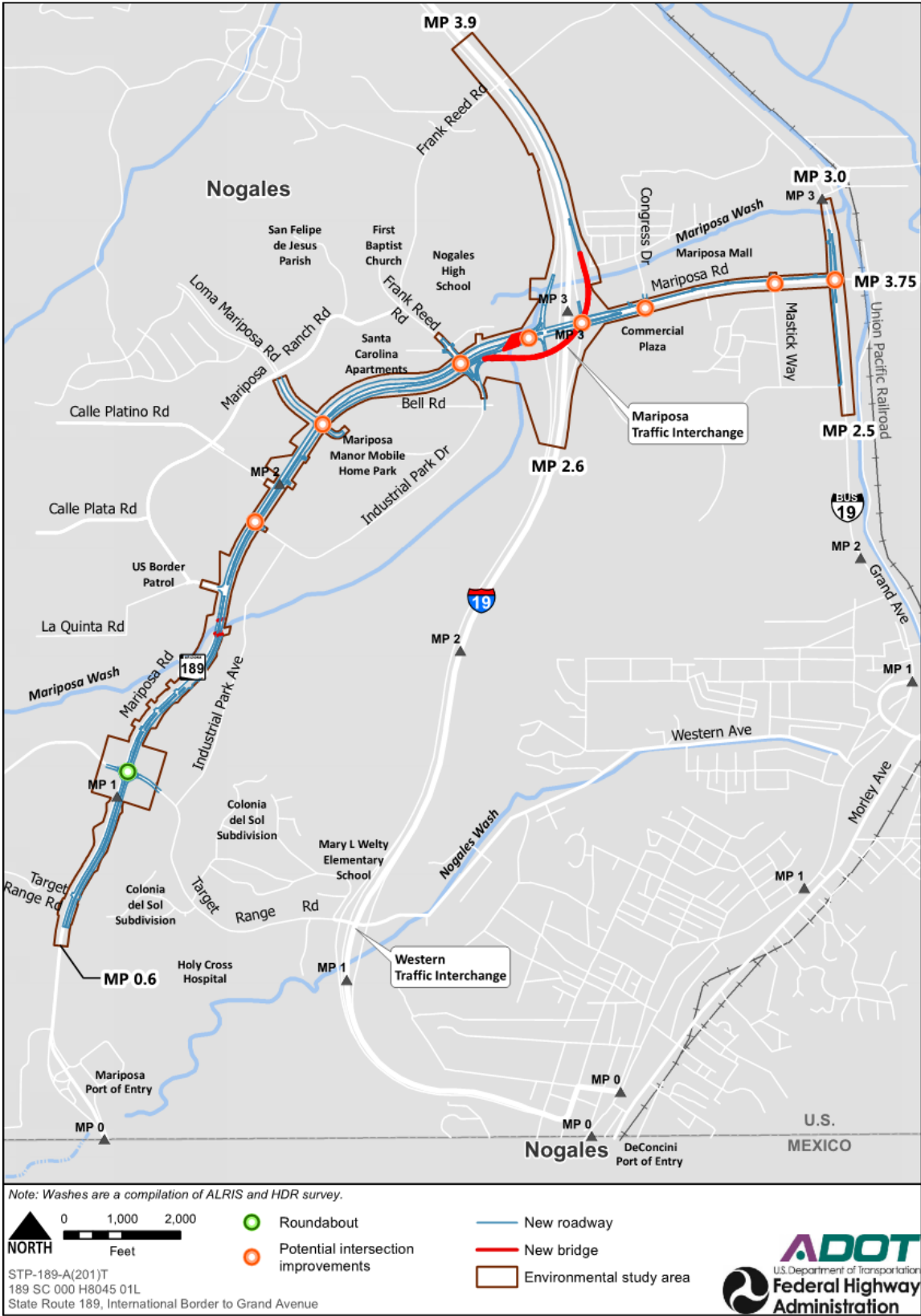
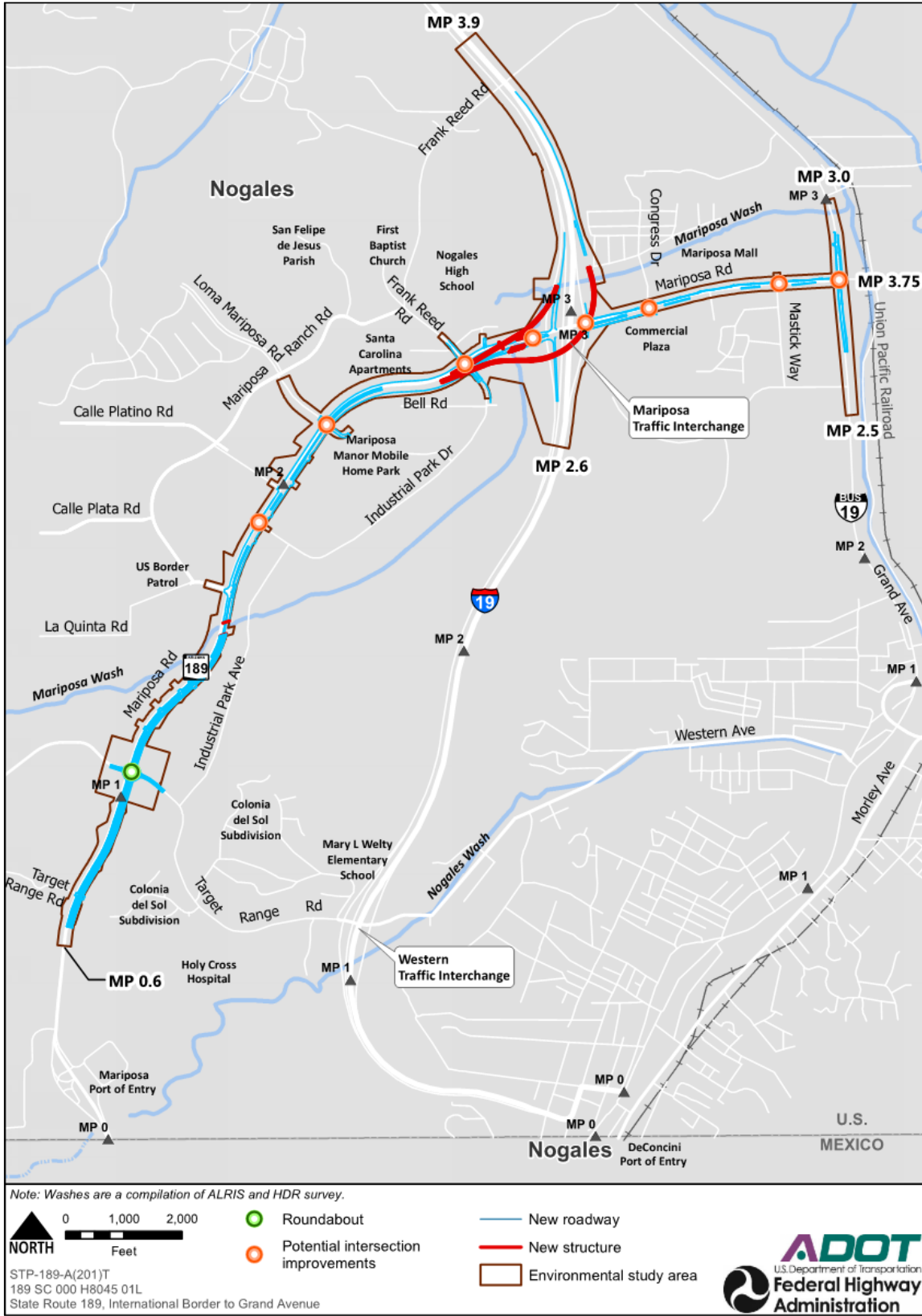


Figure 4-2. Ultimate Condition



4.2 State Route 189

The Recommended Build Alternative was developed to provide the capacity needed for the projected 2040 travel demand and to conform to current geometric design criteria and design practice. This alternative was also developed to accommodate the anticipated growth in traffic while continuing to provide access to existing and future industrial and commercial land uses in the corridor.

Two implementation conditions are presented in the DCR. The descriptions of each implementation condition are presented in the following section. The Recommended Build Alternative plans that show the recommended improvements are presented in Appendix A.

Interim Condition

On SR 189, a raised median is proposed to replace the continuous left-turn lane that separates opposing traffic flows. Pavement widening is required in the corridor to allow for the 16-foot-wide median. The proposed raised median is part of the access management strategy to promote the through movements and reduce side-street friction throughout the corridor. Other access management strategies include driveway modifications and right-in/right-out driveways. Spot improvements will also be implemented at critical intersection locations. At the Mariposa TI, the Interim Condition will provide an east-to-north flyover to connect eastbound SR 189 to northbound I-19. The entrance ramp from SR 189 is at grade at the intersection of Frank Reed Road and SR 189. The exit ramp from southbound I-19 will be widened as it approaches SR 189.

Ultimate Condition

In addition to the improvements on SR 189 for the Interim Condition, the Ultimate Condition adds an additional southbound-to-westbound flyover and significant widening to accommodate the flyover. The exit ramp from I-19 will provide connectivity for southbound I-19 vehicles travelling toward the Mariposa LPOE. This southbound-to-westbound flyover will also be grade-separated at the Frank Reed Road intersection. The Interim Condition eastbound to northbound ramp will be modified to be grade-separated at the Frank Reed Road.

The Recommended Build Alternative plans are included in Appendix A. Corridor intersection improvements for the Recommended Build Alternative is presented in the following subsections.

Freeport Drive

No improvements are planned at this intersection since this is outside of the project limits. Recent improvements were made at this intersection, along with the Mariposa LPOE improvements. The project limits for the Recommended Build Alternative will begin at the end of the existing PCCP limits just north of the Mariposa LPOE.

Target Range Road

The proposed configuration of this intersection will be a roundabout. Three existing driveways are north of the Target Range Road intersection and west of SR 189. The driveway access to these properties will be restricted to northbound left turns into the properties and right out access only when leaving the properties for southbound traffic. The roundabout will provide northbound access for those properties.

Mariposa Ranch Road

Only minor revisions are planned at this location but the existing intersection configuration will remain.

Industrial Park Drive

The dirt driveway north of Industrial Park Drive will be eliminated. This improvement was recommended with the goal of consolidating access points to decrease travel times along the corridor. The Industrial Park Drive will still have the same access as it does today.

Loma Mariposa Road

With a new connection to Bell Road, the recommended improvements will convert this intersection into a four-leg intersection. The improvements at the Loma Mariposa Road intersection for the Interim Condition include additional lanes in the westbound approach, to include a left-turn and through lane; extension of the eastbound left-turn lane bay; additional northbound through lane; extension of the northbound left-turn lane bay; and expansion of the southbound approach by three lanes to include a left-turn, through, and right-turn lane.

In the Ultimate Condition, the Interim Conditions apply, but with additional improvements or modifications that include removal of the westbound left-turn lane; the addition of a barrier-separated through lane and left-turn lane to accommodate the flyover exit-ramp traffic; and the addition of a westbound receiving lane to accommodate the additional through lane from the flyover. The additional lane capacity will provide acceptable LOS for the future travel demand.

Mariposa Park Plaza Driveway

This access point to SR 189 will be modified to right-in/right-out only access in the Recommended Build Alternative.

Frank Reed Road

The improvements at the Frank Reed Road intersection for the Interim Condition include an added eastbound through lane to provide entry to the flyover, an additional westbound through lane, an additional northbound right-turn lane to access the flyover, extension of the northbound left-turn and right-turn bays, and an additional northbound receiving lane to allow free-flow right-turn lanes from the westbound approach. In the southbound approach an additional left-turn lane will be added as well as a right-turn lane.

In the Ultimate Condition, modifications will be made that include the removal of the northbound right-turn to access the flyover. A new south-to west flyover ramp will be grade separated over Frank Reed Road. The Interim Ramp EN will be reconstructed to be grade separated over Frank Reed Road. The additional lane capacity will provide acceptable LOS for the future travel demand. The recommended improvements will also decrease travel times along the corridor. Separation of heavy truck traffic will meet the needs of the local stakeholders.

Valero Gas Station Driveway

Access to SR 189 from this driveway will be modified to right-in/right-out only access. This recommended improvement is needed to reduce cross traffic along the corridor, which will decrease travel times along the corridor.

**Interstate 19 Southbound and Northbound Ramps**

Improvements in the area of the I-19 ramp connection to SR 189 include an additional lane in the westbound direction and a right-turn lane in the westbound direction at the southbound on ramp in the Interim Condition. This recommended improvement was recommended to decrease travel times along the corridor.

**Dairy Queen Driveway**

An additional eastbound and westbound through lane will be provided in area of this existing driveway. This recommended improvement will provide acceptable LOS for the future travel demand and mitigate the queuing associated with the SR 189 approaches.

**Congress Drive**

The improvements at this intersection include an eastbound right-turn lane for the Recommended Build Alternative. Improvements also include southbound dual left-turn lanes and a right/thru lane; a northbound right-turn, left-turn and through lane. This recommended improvement will provide acceptable LOS for the future travel demand.

**Dollar Tree Driveway**

This access point to SR 189 will be modified to right-in/right-out only access in the Recommended Build Alternative.

**Wells Fargo Driveway**

The improvements at this intersection include a westbound receiving lane for the southbound right-turn lane under the Recommended Build Alternative. This recommended improvement will provide acceptable LOS for the future travel demand.

**Mastick Way**

No improvements are proposed at this location.

**Walgreens Driveway**

No improvements are proposed at this location.

**Grand Avenue**

Improvements in this area include an additional through lane in the westbound direction; no changes in the eastbound direction; an additional through lane in the southbound direction; and a third left-turn lane in the northbound direction. This recommended improvement will improve the LOS and travel times, but not at acceptable LOS. Site constraints limit the amount of area available for improvements. Coordination with agencies and local stakeholders will continue as the study progresses.

**4.3 Interstate 19 Traffic Interchange**

The Recommended Build Alternative was developed to provide the capacity needed for the projected 2040 travel demand and to conform to current geometric design criteria and design practice. This alternative was also

developed to accommodate the anticipated growth in traffic while continuing to provide access to existing and future industrial and commercial land uses in the corridor. Interim and Ultimate Condition TI configurations were developed in response to stakeholder and public feedback.

Two conditions are presented in the DCR. Descriptions of each build alternative for the TIs are presented in the following subsections. The improvements were recommended to decrease travel times along the corridor.

**Interim Condition**

At the Mariposa TI, the Interim Condition will provide an east-to-north flyover to connect eastbound SR 189 to northbound I-19. The entrance ramp from SR 189 will be at-grade at the intersection of Frank Reed Road and SR 189.

**Ultimate Condition**

At the Mariposa TI, the Ultimate Condition will modify the east-to-north flyover to be grade separated at Frank Reed Road. An additional southbound-to-westbound flyover (which is also grade separated at Frank Reed Road) is included in this build alternative. The entrance ramp from I-19 will provide connectivity for southbound I-19 vehicles travelling toward the Mariposa LPOE. This southbound-to-westbound flyover will also be grade-separated at the Frank Reed Road intersection.

The Recommended Build Alternative plans are included in Appendix A.

During the Stage II TI screening process, Option D was the TI configuration that appealed to local stakeholders in the area. Resolutions were passed by the City and County in favor of the Option D TI that was presented in the screening report. Implementing this TI option will require the multidirectional flyover ramp and grade-separated structures to be constructed in the first phase. Based on technical analysis and financial considerations, key features from TI Options A and D were incorporated into the Ultimate Condition to address the stakeholders’ input. The Ultimate Condition includes the grade-separated structure and multidirectional flyover ramps. A schematic of the Option D TI is presented in Appendix B.

**4.4 Access Control**

The right-of-way along the SR 189 corridor is currently not access controlled. The existing businesses adjacent to the corridor can access SR 189 using an existing driveway or shared access through a dirt road.

At the Target Range Road intersection, the right-of-way along the SR 189 corridor is currently not access controlled. With the new roundabout configuration, new access control is proposed to allow the roundabout to operate efficiently.

Access control already exists at the Mariposa TI. Access control on I-19 will be maintained in accordance with ADOT and FHWA Access Control Policy requirements.



4.5 Right-of-way

The proposed right-of-way requirements are shown on the Recommended Build Alternative plans in Appendix A. The total estimated right-of-way needed for the Interim is approximately 8 acres and the Ultimate Build Alternative is approximately 19 acres. The majority of the right-of-way requirements are from privately owned properties. Potential easement locations and limits will be determined during final design. A list of affected parcels for the interim and ultimate condition is documented in the EA, Part IV, Section B, *Land Ownership, Jurisdiction, and Land Use*, 2. Environmental Consequences – Recommended Build Alternative, Table 4-1 – SR 189 property acquisition – interim configuration, and Table 4-2 – SR 189 property acquisition – ultimate configuration.

4.6 Drainage

Analysis Criteria

The drainage evaluation was based on requirements in Chapter 600 of the ADOT *Roadway Design Guidelines*. Notable items include:

- As presented in Table 603.2B, the pavement drainage systems shall be designed for a 50-year storm frequency at depressed road locations. For non-depressed roads, the storm drain system shall be designed for a 10-year frequency.
- Depressed road criteria apply to any road with ponded depth (ignoring any drainage system) in excess of 30 inches. In this case, the storm drain systems shall be designed such that the hydraulic grade line is a minimum of 6 inches below top of grate.
- As presented in Table 603.2C, allowable spread on all roads shall not exceed the road gutter width, shoulder, and/or distress lane. On roads with more than one lane in each direction, the spread may encroach upon one-half of the adjacent lane for a 10-year storm frequency.
- The allowable spread should meet the criteria given in Table 603.2C; one-lane ramps shall have a 12-foot unponded width. Allowable spread on two-lane ramps shall not exceed the road gutter width, shoulder, and one-half of the adjacent lane for a 10-year storm frequency.
- Allowable ponding depth on highways shall not exceed the curb height for a 10-year storm frequency.
- The capacity of detention basins and ditches that are parallel to the road and convey road drainage should be designed to meet the requirements of the 10-year storm frequency. Detention basins and ditches that intercept off-site flows should be designed for a 50-year storm frequency, except where other conditions require a greater storm frequency.
- The 100-year storm frequency is also checked to ensure that there are no adverse impacts on properties adjacent to the freeway right-of-way.
- FEMA and local jurisdiction regulations apply for floodplain development.
- Detention/retention basin side slopes would be a minimum 6:1.
- Regional concrete-lined channel side slopes would be 2:1.

Existing Models and Studies

A limited number of studies have been performed in the project area. A list and description of each study that has been acquired is provided below:

- Santa Cruz County, Arizona DIRM and Map Modernization Project, TDN Section 4 – Hydrology, June 2007, completed by Stantec for Santa Cruz County. This report was part of the Technical Data Notebook (TDN) for developing FEMA effective mapping and formally changing the county’s floodplain mapping to the Digital Flood Insurance Rate Map (DFIRM) mapping system. The mapping became effective on December 2, 2011. The hydrology section included information on the characteristics of the watershed and subbasins, as well as hydrologic routing and parameters.
- Flood Insurance Study – Santa Cruz County, Arizona and Incorporated Areas, Vols. 1–3, December 2011. This report is the effective flood insurance study for the county. The report includes effective flood widths, depths, velocities, and associated riverine characteristics. Additionally, the effective discharge rates for various locations along the washes are included for reference.

Coordinated efforts to locate additional reports discussing the development within the corridor and surrounding region has not yielded further documentation. Final design will require additional information to assess drainage infrastructure that appears to have been constructed within the region.

Proposed Drainage Improvements by Others

Plans for future flood control drainage improvements have been identified in the project area. This information was collected through meetings and from exhibits identifying those improvements as provided by the Santa Cruz County Flood Control District. The features have not been further designed beyond initial study concepts. At the time of this report, there is no change to the regulatory flows or floodplains within the project limits. Final design may be required to investigate further the projects and their potential impacts on regional flooding if the concepts are carried further or folded into the regional flood control plan for the region. These projects include but are not limited to:

- Ephraim Canyon Watershed – Large regional detention/retention facility immediately west of the I-19 alignment at the location of the Ephraim thalweg crossing. Exhibits indicate there could potentially be a small reduction in the floodplain limits near the SR 189 and Grand Avenue/B-19 intersection.
- Mariposa Canyon Watershed – Large regional detention/retention facility located 1 mile upstream from Bridge No. 1 at SR 189. Exhibits indicate a reduction in the floodplain limits throughout the additional reach of Mariposa Canyon Wash to the confluence with Nogales Wash.

On-site Drainage

Currently, several proposed typical roadway sections are within the project limits that vary on the extents of proposed pavement widening and median section improvements. For the on-site analysis, three typical scenarios were identified for the variable roadway section:

- Normal crown with raised median and guard rail – embankment curb assumed as edge treatment

- Superelevated section with raised median and guard rail – embankment curb assumed as edge treatment
- Full build – fully developed roadway section with raised median and curb and gutter edge treatment

The road cross section is proposed as normal crown geometry, except in areas of superelevation. Areas identified as containing a super elevated roadway section allow runoff to flow toward the inside median. Catch basins and storm drain systems will collect the accumulated roadway runoff with either raised median or vertical curb end treatment. Areas with embankment curb as the edge treatment will utilize concrete or riprap spillways for pavement drainage control.

ADOT Standards C-15.20, C-15.40, and C-15.80 catch basins are used to intercept the flows along the main line and right-of-way. Runoff collected in the catch basins will be conveyed in storm drains. A series of detention ponds are utilized to mitigate increased on-site runoff and provide first flush of the stormwater as per ADOT's Best Management Practices. Currently, ADOT is revising its stormwater policy, and the basin design would need to be reevaluated during final design.

The infrastructure needed for the on-site drainage system will be determined during final design. The following describes site-specific considerations:

- Spillways will be required to control pavement runoff developing along embankment curbs.
- At the Industrial Park Drive and SR 189 intersection, existing on-site drainage facilities include catch basins and storm drain piping. The proposed roadway improvements will require extending and expanding the existing system to include additional inlets to capture and control runoff. The existing outfall along the northwestern abutment section of Bridge No. 2 at Mariposa Canyon Wash will be maintained.
- As per ADOT Best Management Practices and MS4 Permit the increased runoff from the additional pavement proposed in both the interim and ultimate condition detention facilities will be mitigated and treated before it is conveyed to the final outfall, Mariposa Wash.
- The Target Range Road and SR 189 intersection will utilize a roundabout as traffic control. On-site drainage will be required to maintain a safe roadway passage. Additional due to increase pavement a local on-site basin will be required for water quality control.
- Additional pavement, particularly within the region of the Frank Reed Road and SR 189 intersection, will be added for the Ultimate Condition. Therefore on-site drainage systems and water quality treatment will need to be reconfigured to accommodate the additional flows.
- Due to the vertical configuration of east-to-north flyover ramp there will be a sump within the ramp located approximately 123-ft upstream from Mariposa Wash Bridge No. 2. Deck drains will be required to control discharge and mitigate ponding within the ramp roadway section. Due the grades of the ramp and existing terrain, the ramp inlets will drain directly into the Mariposa Wash. Water quality treatment will be administered through the ramp inlets with oil and grit separation provided within the structure itself. Additionally measure

will be taken to mitigate against additional contaminants being discharged directly into the wash which is a tributary to the Nogales Wash and Santa Cruz River which are listed as impaired water ways with ADEQ.

### Off-site Drainage

A drainage master plan has not been developed for the region associated with the project area. Therefore, a schematic of the existing freeway was overlaid onto an existing contour surface, as provided by Santa Cruz County Flood Control, to develop subbasin layouts and determine the flow path for existing off-site conditions. Based on the delineated watershed sizes the ADOT Rational Method Tool was utilized to assess peak discharges at cross culverts and other off-site facilities controlling storm water discharge.

FEMA effective discharge rates as identified in the effective Flood Insurance Study for the county were utilized for a preliminary assessment of the floodplain impacts due to the proposed bridge modifications at Mariposa Bridge No. 1 and Mariposa Bridge No. 2 and the placement of ramp piers within the regulatory floodwaters.

### Section 404 of the Clean Water Act

The U.S. Army Corps of Engineers (USACE) administers Section 404 of the Clean Water Act (CWA), which regulates the discharge of dredged or fill material into waters of the United States (jurisdictional waters), including wetlands. USACE regulates jurisdictional waters through permitting, using nationwide and individual permits.

Types of waters that are regulated include wetlands, ephemeral washes, perennial streams, springs, riverbeds, and special aquatic sites. Functional values are a key component in determining the associated permitting and mitigation of jurisdictional waters.

The proposed freeway will require the placement of structures such as bridge substructures into jurisdictional waters, leading to the discharge of dredged or fill material into Mariposa Canyon Wash.

It is anticipated that a nationwide permit will be required for the SR 189 project in the interim condition and that an individual permit will be required in the ultimate condition. On February 8, 2005, FHWA, ADOT, and USACE entered into an operating agreement that applies to transportation projects that will require both an FHWA action under the National Environmental Policy Act and a USACE individual permit under Section 404 of the CWA (USACE 2005). The operating agreement commits FHWA, USACE, and ADOT to integrating the National Environmental Policy Act and Section 404 of the CWA in the transportation planning, decision-making, and implementation processes. According to the operating agreement, when avoidance of jurisdictional waters is not practicable, minimization of impacts will be achieved, and unavoidable impacts will be mitigated to the extent possible. The permitting process for Section 404 requires CWA Section 401 certification. This certification is regulated by ADEQ for jurisdictional waters, except on tribal land. Since these initial agreements were made, many regulatory and landscape changes have occurred. New jurisdictional delineations will be performed, and all permitting requirements will be met between production of the draft and the final EA documents.

ADOT will prepare a water quality certification application in accordance with Section 401 of the CWA as part of the Section 404 permitting process. The application will be submitted for review and approval by ADEQ. The



steps outlined below will be taken by ADOT to satisfy provisions of Section 401(b)(1) of the CWA in accordance with Section 404 (USACE 2005):

- Minimize impacts by limiting the degree or magnitude of the freeway and its implementation by using appropriate technology or by taking affirmative steps to avoid or reduce impacts.
- Rectify impacts by repairing, rehabilitating, or restoring the affected environment.
- Reduce impacts over time through preservation and maintenance operations during the life of the freeway.
- Compensate for impacts by replacing, enhancing, or providing substitute resources or environments.
- Monitor impacts and take appropriate corrective measures.

**Floodplain Encroachment**

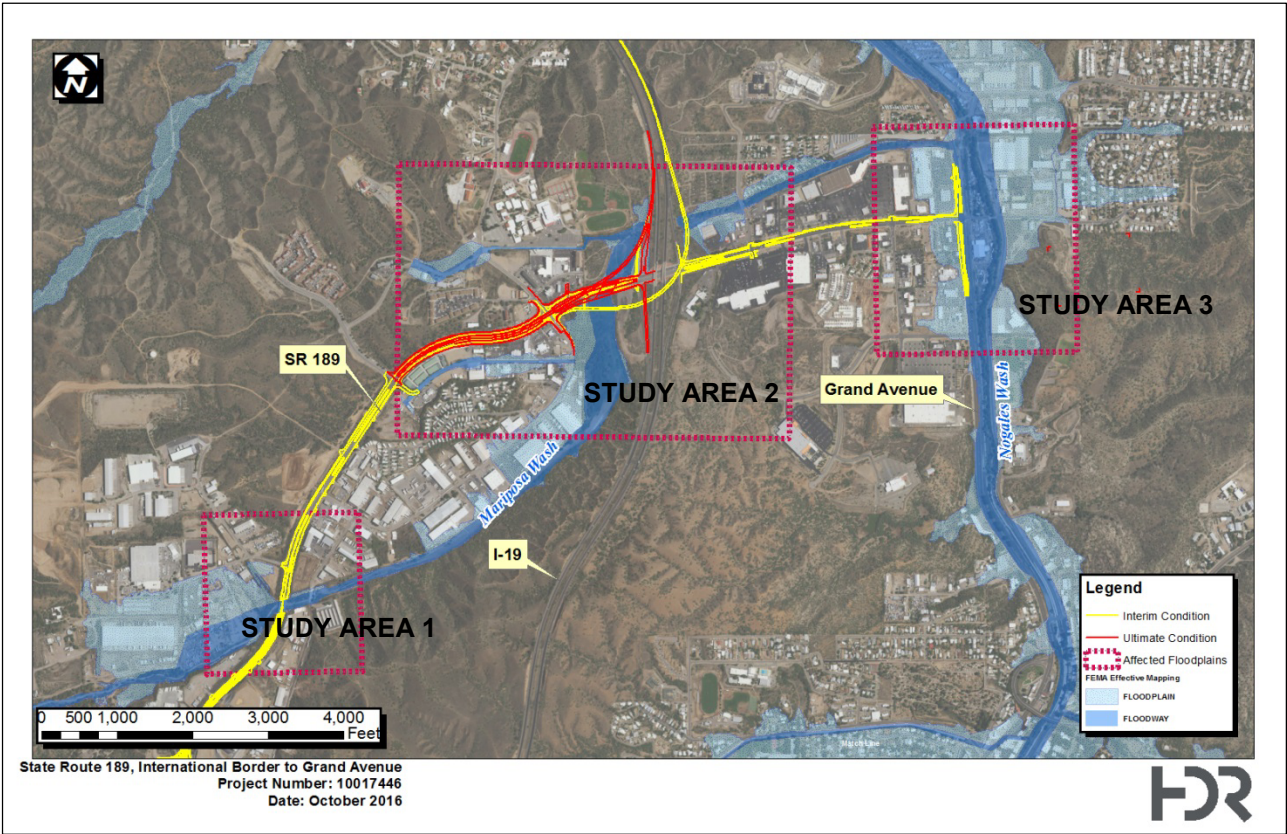
All projects within FEMA regulatory floodways must undergo an encroachment review to determine their effects on flood flows and possible impacts on regulatory floodplains/floodways.

A review of FEMA Flood Insurance Rate Maps (FIRMs) indicates that portions of the proposed alignment alternatives will affect the 100-year floodplain (see Figure 4-3). Impacts on floodplains typically occur when the topography of the project area is substantially modified by either placement or removal of material within the floodplain. The alignment for SR 189 is above the elevation of the effective floodplain elevation, but could potentially reduce the overall conveyance capacity of the existing floodplain. Impacts within the effective floodway will primarily result from the widening of bridges along Mariposa Canyon Wash and additional structural features introduced into the floodplains as part of the ramp configurations at the SR 189/I-19 TI. As shown in Figure 4-3, there are three areas where the project limits affect effective floodplains. Each section has been reviewed further to assess potential impacts and to better understand existing and proposed conditions within the effective floodplains.

**Area 1 – Mariposa Canyon Wash Bridge No. 1**

As shown in Figure 4-3, Mariposa Canyon Wash is conveyed from the southwest to the northeast through the existing bridge, identified as Mariposa Bridge No. 1 in ADOT as-built records.. Floodwaters are directed through the structure with the extended soil cement abutment protection that wraps around the fill slopes and extends well below the channel bottom. Upstream, the northern overbank is inundated with floodplain waters associated with backwater effects caused by the rapid contraction of flow at the bridge. Downstream from the structure, the floodway and floodplain are nearly identical. There is little to no overbank discharge within the surrounding floodplains. Improvements to the existing roadway are minimal within the location. Existing abutments will not be extended and, therefore, it is anticipated that there will be a “no rise” scenario at this location.

**Figure 4-3.** Effective floodplains within the project limits



**Area 2 – Mariposa Canyon Wash Bridge No. 2 to Interstate 19**

Area 2 extends from the Loma Mariposa Road access point to approximately 1,200 feet east of the Mariposa TI. As shown in Figure 4-3, Mariposa Canyon Wash traverses from south to north through Bridge No. 2, then turns 90 degrees to flow directly east beneath I-19 by way of three 14-foot-diameter CMPs approximately 550 feet north of the SR 189 alignment. According to as-built information, Bridge No. 2 has soil cement treatment for bank and channel stabilization, similar to Bridge No. 1.

Throughout Area 2, most of the flow is contained in the main channel. However, effective floodplain mapping indicates discharge breakout over the western bank and depicts a wide, expansive floodplain inundation of land that is partially developed with commercial properties. Additional overbank discharge is indicated downstream of the large CMPs.

The widening of SR 189 at Bridge No. 2 will require extension of the existing abutments, both up- and downstream of their current locations for the Ultimate Condition. As previously discussed, extensive scour mitigation features are located throughout the structure. Given the shift in location of the abutments, the soil cement lifts will be affected and may need to be widened or have lifts added for slope stability and to maintain the intended scour mitigation measures. Figure 4-3 is an overview of Area 2. At the time of this report, the roadway design indicates very minimal fill slope intrusion; however the ramp configurations for both the Interim and Ultimate condition will require large diameter piers to be placed within the floodplain limits. Additionally the interim condition will require an abutment to be placed southeast of the Frank Reed Road and SR 189 intersection which



will further encroach upon the effective floodplain . The total affected floodplain area will be 1.5 acres, with 100 percent of that area categorized as Zone AE.

While Bridge No. 2 is the primary feature within the effective floodplain limits of this region, several other features could also affect regulatory floodplains because of proposed design features. Those additional features have been identified as the following:

- **Bell Road Improvements** – Current design include a new access to Bell Road from the Loma Mariposa Road and SR 189 intersection. These improvements include an extended roadway section that is in the effective mapping of the Mariposa Canyon Wash Tributary 2 (Reference FIRM Panel 04023C0627C).
- **Industrial Park Drive Improvements** – The current design includes improvements to the southern portion of the Industrial Park Drive and SR 189 intersection. Specifically, the southeastern corner includes access to the Ultimate Condition ramp, allowing east-to-north traffic movement for I-19 access. The access point includes an extended ramp section within the floodplain limits of Mariposa Canyon Wash.
- **Flyover Ramps** – The future flyover ramps will require multiple piers for stability. In all, thirteen of the 9-foot-wide piers are within the mapped floodwaters, including eight within the floodway limits. Additionally, a separate full height bridge abutment is on the western bank of Mariposa Canyon Wash. This feature along with fill slopes from the widened intersection will lie partially within the regulatory floodplain.
- **Single Barrel 10-foot-by-5-foot Box Culvert** – As previously mentioned, an existing 10-foot-by-5-foot box culvert is just east of the Mariposa TI. Based on current design, the box will require extension based on the expansion of SR 189. The proposed outfall of the box culvert lies within the effective floodplain of the Mariposa Canyon Wash.
- **I-19 Ramp A** – Because of the widening of SR 189, the southbound ramp (Ramp A) of I-19 will require a realignment and expansion. In the Ultimate condition the ramp alignment will be relocated to the east and further away from the floodplain limits. However during design the fill slopes should be reviewed to assess impacts, if any, to the regulatory floodwaters.

Area 3 – Congress Drive to Grand Avenue

As shown in Figure 4-3, Area 3 extends from the intersection of Congress Drive and SR 189 to the terminus of the project at SR 189 milepost 2.87, at the intersection of SR 189 and Grand Avenue/B-19. The effective FEMA mapping indicates wide floodway and floodplain limits in the region associated with the confluence of the Nogales and Mariposa Canyon Washes immediately north of the intersection.

There are currently no plans to raise or adjust the existing roadway profiles on either SR 189 or Grand Avenue. Therefore, the widening of the roadway may potentially increase the capacity of the roadway sections of Grand Avenue and SR 189 and also potentially will have minimal to no impacts on the overall floodway/floodplain drainage patterns in the region.

As indicated by Santa Cruz County Flood Control representatives, there is high scour potential within Mariposa Wash and Nogales Wash. Both local and general scour calculations will be required to assess the stability of the structures within the perinial environments. To determine foundation depths required for structural stability a

coordinated effort between the hydraulics, geotechnical, and structural engineers will be required throughout the design.

Assessment of the “no rise” water surface elevations will progress into the 30% and final design plans. If future assessments reveal that the preferred alignment has a significant impact on the developing floodplains, and mitigation measures are not feasible, then a separate Conditional Letter of Map Revision will be developed to address floodplain impacts and revised extents of the floodplains.

The integration of the SR 189 off-site system and the existing flood control features within the region would require extensive coordination. Regional parties and their associated interests would include:

- FEMA – floodplain development and management
- Santa Cruz County Flood Control District – floodplain development and management
- ADOT – operation and maintenance of proposed facilities

4.7 Earthwork

Excavation material will be generated at the roadway widening sections that are in cut. The new elevated profiles for grade-separated structures will require extensive fill material for the flyover ramps. The earthwork volumes are based on an assumed shrinkage factor of 12 percent and do not take into account the structure backfill requirements behind the bridge abutments and retaining walls. The earthwork was evaluated for both the Interim and Ultimate Conditions.

The earthwork associated with the crossroads and ramps at each location was added to the main line earthwork to obtain the total earthwork for the Interim and Ultimate Conditions. The earthwork volumes shown do not take into account the special backfill requirements that may be necessary behind the retaining walls. The earthwork summary is presented in Table 4-2.

Table 4-2. Earthwork requirements

Location	Excavation (cubic yards)	Embankment (cubic yards)	Borrow required (cubic yards)
Interim Condition	271,000	306,000	35,000
Ultimate Condition	67,000	375,000	308,000

4.8 Traffic Design

The following sections describe the proposed concepts for guide signs, pavement marking, lighting, FMS, and traffic signals. The traffic design concepts were developed based on guidelines from the following documents:

- Manual on Uniform Traffic Control Devices (FHWA 2009)
- Arizona Supplement to the Manual on Uniform Traffic Control Devices (ADOT 2009a)

- ADOT Traffic Signals and Lighting Standard Drawings (2015, with updates)
- ADOT Signing and Marking Standard Drawings (2015, with updates)
- ADOT Manual of Approved Signs (2015, with updates)
- ADOT Intelligent Transportation System Design Guides (2015, with updates)
- ADOT Traffic Guidelines and Processes (2015, with updates)
- ADOT Traffic Control Design Guidelines (2010 version)

During final design, coordination will continue with any current design and construction projects underway within this corridor.

**Signs and Pavement Markings**

*Interim Condition*

Changes to signs along SR 189 would include adding one new advance overhead guide sign on a cantilever structure for SR 189 eastbound and one ground-mounted guide sign for Frank Reed Road northbound to guide traffic to the new SR 189 eastbound-to-I-19 northbound flyover ramp (Ramp EN). In addition, the existing tubular sign structure-mounted guide signs along SR 189 eastbound and westbound near the I-19 TI will be removed as part of the SR 189 widening and will be replaced with a new sign structure. The existing border crossing information guide signs would be replaced with new signs and relocated to accommodate the roadway widening. New guide signs will be placed on all approaches of the proposed roundabout at SR 189 and Target Range Rd.

Various other ground-mounted guide and warning signs would be revised or relocated to accommodate the roadway widening and the introduction of the new Ramp EN.

A merge sign (W4-1R) will be added to I-19 northbound to warn drivers of the newly added Ramp EN traffic.

Pavement marking will consist primarily of new striping for the proposed roadway widening and TI changes.

Some stripe obliteration and restriping would be needed along I-19 since the new ramp would merge with the I-19 northbound main line.

*Ultimate Condition*

Various other ground-mounted guide and warning signs would be revised or relocated to accommodate the roadway widening and the introduction of the new west-to-north ramp from SR 189 to I-19.

New guide signs will be installed along I-19 southbound to notify drivers of the new southbound-to-westbound flyover ramp (Ramp SW), with grade separation at Frank Reed Road.

A merge sign (W4-1R) will be added to I-19 northbound to warn drivers of the newly added Ramp EN traffic.

Pavement marking will consist primarily of new striping for the proposed roadway widening and TI changes.

Some stripe obliteration and restriping would be needed along I-19 as the new ramp merges with the I-19 northbound main line.

**Lighting**

Partial TI lighting currently exists at the Mariposa TI. The addition of Ramp EN from SR 189 to I-19 requires modification to the existing northbound on-ramp lighting and installation of additional light poles to light the existing northbound on-ramp and the new ramp to provide adequate lighting levels for the ramps.

In addition, 100-foot-tall mast poles shall be added at TI to provide adequate lighting levels to the new ramp structures.

In the ultimate condition, light poles shall be installed along the ramp structures starting west of Frank Reed Rd to provide adequate lighting levels on ramp structures, as they approach the TI high mast lighting.

There is currently no existing street lighting along the SR 189 corridor. The signalized intersections along SR 189 have intersection lighting. All the proposed new signals and existing signal modifications shall include intersection lighting as part of the signal design. The proposed roundabout at the SR 189 and Target Range Rd will include intersection lighting as part of the design.

**Freeway Management System**

Currently, four ADOT traffic count stations are in the project segment where roadway improvements are proposed. This project proposes to replace the existing count stations as part of the roadway widening.

This project proposes installation of two DMS, along with CCTV cameras, one in each direction (eastbound and westbound) along SR 189. In accordance with the ADOT ITS Design Guide, the DMS will use the Arizona Department of Public Safety radio system to communicate between the Traffic Operations Center operator and the DMS in the field and will use cellular carriers for the CCTV images.

The future Intelligent Transportation System needs for the SR 189 corridor should be evaluated during final design to allow placement of appropriate FMS conduits, pull boxes, crossovers, and fiber along SR 189 and at the Mariposa TI to provide integration with the ADOT FMS system.

**Signalization**

Traffic signals proposed and modified as part of this project would be designed in accordance with the ADOT Traffic Signals and Lighting Standard Drawings (2015).

New traffic signals will be installed at the Loma Mariposa Road and SR 189 intersection. The existing signals at Frank Reed Road, Mariposa TI (on- and off-ramp intersections), Congress Drive, Mastick Way, and Grand Avenue will be modified to accommodate the roadway widening and intersection improvements.

No conceptual traffic signal design is currently shown.

SMART Infrastructure

Smart infrastructure technologies, collectively known as intelligent transportation systems (ITS), are being embedded in traffic lights, car parks, roads and bridges, making them increasingly able to communicate with each other and with the vehicles that use them. Together these innovations offer the prospect of a transport infrastructure system that suffers less congestion, is safer, and can be maintained predictively.

It is anticipated that the freight industry will be rapidly moving to smart vehicle technologies to improve transport efficiency. Consideration should be given to equipping traffic signals with infrastructure to vehicle (I2V) and vehicle to infrastructure (V2I) communications capability. This will include intersection mapping and Signal Phasing and Timing (SPAT) communication. All such improvement shall be coordinated with the proposed FMS improvements.

4.9 Construction Sequencing

This section discusses the potential construction sequencing plans for the Mariposa TI improvements, and the SR 189 widening to the east and southwest. A description of each construction phase is included in Table 4-3.

Construction will affect both the I-19 and SR 189 corridors. On I-19, work will be ongoing in the right shoulder for construction of the ramps. Short overnight closures of I-19 will be required to complete the bridge construction across I-19, including placing precast girders (or falsework); pouring concrete for the superstructure, deck, and barriers; and miscellaneous work. Detour plans for alternative routing of I-19 traffic will be required during these periods.

Impacts on traffic along SR 189 will be constant and will last for the duration of the project. However, it is essential that traffic be maintained through this area. A minimum of one lane in each direction is essential, but certain periods of the day may require that two lanes (either inbound, outbound, or both) be maintained.

Detailed construction sequencing plans will be developed during final design to implement these goals.

Table 4-3. Construction phasing

Construction phase	Work description
Phase 1a	Construct foundations, columns, and bents for Ramp EN and Ramp SW.
Phase 1b	Construct girders/decks or cast-in-place bridge decks. OR Construct superstructures for Ramp EN and Ramp SW. Construct tie-ins to the I-19 main line.
Phase 2a	Construct all outside widening along the northern side of SR 189.
Phase 2b	Construct all outside widening along the southern side of SR 189, including the tie-in of Ramp EN.
Phase 2c	Construct median improvements along SR 189, including the tie-in of Ramp SW to the median area.
Phase 3	Construct and complete all miscellaneous improvements.

4.10 Maintenance of Traffic

Traffic will be managed through detailed traffic control plans, procedures, and guidelines specified in Part VI of the *Manual of Uniform Traffic Control Devices*, 2009 Version, the *Arizona Supplement to the Manual of Uniform Traffic Control Devices*, and by the *ADOT Traffic Control Design Guidelines*, 2010 version. The final construction phasing and traffic control plans will be developed during final design.

Interstate 19 Structures

All the existing travel lanes on I-19 will remain open to traffic most of the time during construction. Temporary concrete barriers should be used for protection while constructing bridge piers, abutments, and sign structures adjacent to the travel lane. However, limited weekend and night closures of one or more travel lanes may be needed to facilitate construction of the bridge across I-19, including precast girder placement and deck pours.

Ramp Widening

Construction of the ramp merge and diverge areas will occur with the temporary closure of the I-19 outside shoulders. Temporary concrete barriers should be used for protection while construction occurs adjacent to the I-19 travel lanes.

State Route 189

During the reconstruction of SR 189 along the existing alignment, the roadway will remain open to traffic most of the time. Temporary concrete barriers should be used for protection, while access to existing businesses will be maintained at all times. Most of the traffic signals, or temporary signals, will still be operational. However, limited weekend and night closures of one or more travel lanes may be needed to facilitate construction of various features. The final construction phasing and traffic control plans will be prepared to cover various contingencies.

4.11 Utilities

The Recommended Build Alternative will affect existing utilities, resulting in the need to modify and/or relocate the utilities before or during construction. Utility relocations will result in no disruption, or brief disruption, of services. Utility relocations will be staged so as to minimize impacts to residences and businesses within the project area.

With construction of an elevated ramp over the Frank Reed Road intersection, SR 189, and I-19, the Recommended Build Alternative will have vertical conflicts with existing overhead power lines west of the Frank Reed Road intersection. Additional pole height will be required for the power lines to cross over the future entrance and exit ramps. Given the vertical profile of the future ramps, rerouting of the overhead power may be necessary just west of the Frank Reed Road intersection. New public utility easements may be required for the relocation of the power lines. The widening of SR 189 may require the relocation of the power poles along the northern and southern sides of SR 189 between Target Range and Frank Reed Roads. The poles will be adjacent to their current locations.

Other utilities that will be affected by this project include water and sewer lines along SR 189, AT&T telephone and fiber optic lines along SR 189, CenturyLink coaxial and fiber, El Paso Natural Gas pipelines, UniSource Energy



Service electric and gas, City of Nogales sewer and water, and ADOT and Arizona Public Service underground power lines.

Utility relocation plans will be developed according to the Policy for Accommodating Utilities on Highway Rights-of-Way (ADOT 2009c) during final design. Utility companies will be provided with the preliminary design plans (Appendix A) to identify any utilities that need to be relocated and/or adjusted prior to construction.

4.12 Structures

Mariposa Canyon Bridge No. 1 Widening

Location

Mariposa Canyon Bridge No. 1 carries SR 189 northbound and southbound traffic cross over Mariposa Canyon Wash. It is just west of the Mariposa Ranch Road.

Proposed Conditions

No bridge widening is anticipated at Mariposa Canyon Bridge No. 1. Additional details will be provided in the initial bridge selection report.

Mariposa Canyon Bridge No. 2 Widening (Interim and Phased Ultimate)

Location

Mariposa Canyon Bridge No. 2 carries SR 189 westbound and eastbound traffic across the Mariposa Canyon Wash. It will be just west of the Mariposa TI.

Proposed Conditions (Interim)

The widening of this bridge will occur at the north side of the existing structure to accommodate one additional westbound lane and median widening on SR 189. It is assumed the widened portion of the bridge will match the existing bridge length and follow the existing bridge abutment and pier line skew to minimize hydraulic impact. The total width of the widening will be 15 feet – 6 inches at abutment 1 and 20 feet – 6 inches at abutment 2. Two types of superstructure could be considered:

- A three-span, continuous, CIP structure concrete box to match the existing superstructure. This superstructure type will require falsework over the Mariposa Canyon Wash 100-year floodway and floodplain during construction.
- A three-span precast prestressed concrete box beam set adjacent to each other to form the superstructure for the widened bridge structure.

It is anticipated that the widened structure will have pier columns supported on drilled shaft foundations. The abutments will match the existing abutment type, with a stub abutment at abutment 1 and a full-height wall abutment at abutment 2. The foundation of both abutments is anticipated to be supported on drilled shaft. The foundation for the widened section will penetrate through the existing soil cement bank protection. New soil cement bank protection will be constructed in both abutments to match the existing bank protection configuration.

Proposed Conditions (Phased Ultimate)

The Phased Ultimate widening of this bridge will occur at south side of the existing structure to accommodate two additional lanes in the eastbound direction and median widening on SR 189. It is assumed the widen portion of the bridge will match the existing bridge length and follow the existing bridge abutment and pier line skew to minimize hydraulic impact. The total width of the widening will be 49 feet at abutment 1 and 36 feet – 4 inches at abutment 2. Two types of superstructure could be considered:

Similar superstructure and substructure system considered for Interim will apply for the Phased Ultimate Conditions.

Ramp East-to-North (Interim)

Location

The proposed Ramp East-to-North (EN) is a flyover that carries SR 189 eastbound traffic at the Frank Reed Road intersection onto northbound I-19. The structure crosses over the Mariposa Wash 100-year floodplain at two locations and various Mariposa TI features that include the I-19 southbound on-ramp, the I-19 main line, the SR 189 main line, and the I-19 northbound on-ramp.

Proposed Conditions

The Ramp EN typical roadway section consists of one 12-foot lane, a 6-foot inside shoulder, a 10-foot outside shoulder for a clear roadway width of 28 feet. The superstructure width will include a 1 foot and 7-inch-wide, 42-inch-tall F-shape barrier at the edge of each side for a total bridge width of 31feet-2 inches.

The alignment of the ramp structure begins just east of Frank Reed Rd on a horizontal tangent spanning over the Mariposa Wash 100-yr and 500-yr floodplain and quickly transitions into a horizontal curve to cross I-19 southbound on-ramp, I-19 mainline, SR 189 mainline, and I-19 northbound on-ramp. Ramp EN ends just after crossing Mariposa Wash 100-yr flood plain near the north end of the project study limit. The entire bridge is located within a vertical crest curve. Piers will be located within the Mariposa Wash 100-yr floodway, between I-19 northbound and southbound mainline, and adjacent to sidewalks behind SR 189.

The traditional solution for wash crossings such as the Mariposa Wash in Arizona has been the precast, prestressed concrete I girders. This type of structure will eliminate the risk for constructing superstructure type that requires shoring and falsework over the wash in the case of an unexpected flood. Typical structure type for directional ramp spans over the TI is CIP PT box girder. Ramp EN requires a span of approximately 230 ft to cross over the TI which is feasible to use CIP PT box girder superstructure.

Depending on the traffic closing restrictions for the TI area, three different superstructure systems will be considered:

- A system consisting of precast prestressed AASHTO I girders and CIP Post-Tension (PT) box girder with 3 straddle piers

- A system consisting of precast prestressed AASHTO I girders and CIP PT box girders with 3 straddle piers and drop in span
- A system consisting of CIP PT box girder and steel plate girder

For the cost estimate of this study, Ramp EN superstructure is assumed to be precast prestressed AASHTO I girders over 100-yr flood plain locations and CIP PT box girder in the remaining spans with 3 hinges which results in a total bridge length of 2,385 feet with a total of 14 spans. The bridge length and number of spans could be revised with further refinement.

Abutments of the proposed flyover bridge will be full-height wall abutment supported on drilled shafts. A single round column with hammer head cap supported on drilled shaft will be used in the 100-year flood way area to minimize hydraulic impact to the wash. Rectangular blade column supported by a large diameter shaft will be used outside of 100-year flood way area.

Further evaluation of each feasible superstructure system based on structural requirements, aesthetics, economic feasibility, construction considerations, and long-term serviceability will be perform for the initial Bridge Selection Report.

**Ramp EN –Ultimate (Phased Ultimate)**

*Location*

The proposed Ramp EN ultimate alignment would carry SR 189 eastbound traffic over Industrial Park Drive/Frank Reed Road in order to provide vertical clearance over Industrial Park Drive. The ultimate ramp extension would connect back to the interim alignment within the third span of the interim ramp bridge. This would require a partial reconstruction and extension of the Ramp EN structure.

*Proposed Conditions*

The ramp extension would begin west of Frank Reed Road Intersection on a horizontal tangent and a crest vertical curve. It immediately crosses over SR 189 eastbound and Industrial Park Drive requiring a straddle bent pier over SR 189 eastbound and a single column pier placed in median of Industrial Park Drive. The alignment then transitions to a horizontal curve and enters a sag vertical curve before tying into the interim alignment on a horizontal tangent over the Mariposa Wash 100-year flood plain.

The typical roadway section of the Ramp Bridge extension will match that of the interim which consists of one 12-foot lane, a 6-foot inside shoulder, and a 10-foot outside shoulder for a clear roadway width of 28 feet. The superstructure width would include a 1 foot and 7-inch-wide, 44-inch-tall F-shape barrier at the edge of each side for a total bridge width of 31 feet-2 inches.

The horizontal and vertical alignment of the ultimate ramp extension matches the interim configuration at the Interim bridge Pier 3. To minimize throw away bridge, the ultimate bridge layout would retrofit and salvage structural elements from the interim configuration as much as possible. Only Interim Pier no 2 and no 3 can be incorporated into the Ultimate structure. The I girders of Interim Span 3 would be removed and salvaged. The bearing seats of Interim Pier 2 would be reconstructed to the required elevations needed for the Ultimate profile

and the existing girders reset on the new bearing seats. In addition, eight new spans will be constructed to complete the ultimate ramp extension. This results in a proposed bridge extension length of approximately 1262 feet with 9 spans (1 retrofit and 8 new). The total Ramp EN bridge length, including the ultimate extension, is approximately 3242 feet with 20 spans. The bridge length and number of spans could be revised with further refinement.

Two types of superstructures could be considered for the eight new spans of the ramp extension segment depending on the selected alternative for the Interim configuration:

- A system consisting of precast prestressed AASHTO I girders and CIP Post-Tension (PT) box girders
- A system consisting of only steel plate girders

For the initial DCR, the ultimate superstructure is assumed to be two precast prestressed AASHTO I girders spans for the entire Ultimate extension segment.

Similar to the Interim, substructure and foundation systems with some variation are proposed for the ultimate configuration to satisfy its specific constraints while maintaining consistency with the interim configuration.

Further evaluation of each feasible superstructure concept based on structural requirements, aesthetics, economic feasibility, construction considerations, and long-term serviceability will be perform for the initial Bridge Selection Report.

**Ramp South-to-West (Ultimate)**

*Location*

The proposed Ramp South-to-West (SW) is a flyover that carries I-19 southbound traffic onto SR 189. The structure diverts from I-19 southbound off-ramp, cross Mariposa Wash 100-year floodplain, and SR 189 eastbound. Ending in the median of SR 189 west of The Frank Reed Road Intersection.

*Proposed Conditions*

Ramp SW typical roadway section consists of one 12-foot lane, a 6-foot inside shoulder, and a 10-foot outside shoulder for a clear roadway width of 28 feet. The superstructure width would include a 1 foot and 7-inch-wide, 44-inch-tall F-shape barrier at the edge of each side for a total bridge width of 31feet-2 inches.

The alignment of the SW ramp structure begins in the median of SR 189 intersection, west of Frank Reed Road with a horizontal tangent and entering a vertical crest curve. It immediately crosses over Frank Reed Road with piers located near SR 189 median nose at each side of Frank Reed Road and stays within the SR 189 median. The ramp stays on a horizontal tangent while spans over SR 189 eastbound with a straddle bent. It then transition to a horizontal curve before crossing the Mariposa 100-yr flood plain. The alignment then merges with the I-19 southbound off-ramp. The bridge ends before the converge point of the Off Ramp

Depending on the traffic closure restrictions at The Frank Reed Road Intersection and SR 189, three different superstructure systems could be considered:

- A system consisting of precast prestressed AASHTO I girders and CIP Post-Tension (PT) box girder with 1 straddle pier.
- A system consisting of only precast prestressed AASHTO I girders with 1 straddle pier.
- A system consisting of only steel plate girders.

Due to majority segment of Ramp SW being located within the Mariposa Wash, a superstructure system consisting of only precast prestressed AASHTO I girders are assumed for the superstructure cost estimate. This bridge alternative consists of 14 spans and a total length of 2,032 feet. The bridge length and number of spans could be revised with further refinement. It is assumed a roadway closure will not be allowed at the intersection of Frank Reed Rd and SR 189 as it is the major access to the local community. This would require a 165-ft span structure to cross over the Intersection. It is assumed a high strength concrete AASHTO I girder would be used.

Abutments of the proposed flyover bridge would be full-height wall abutments supported on drilled shafts. To be consistent with the substructure system of Ramp EN, a round column with hammer head cap supported on a drilled shaft would be used. All Piers except a straddle bent will be needed over SB SR 189 to satisfy structure and vertical clearance requirement.

Further evaluation of each feasible superstructure concept based on structural requirements, aesthetics, economic feasibility, construction considerations, and long-term serviceability will be perform for the initial Bridge Selection Report.

**4.13 Pavement and Geotechnical**

During final design, a geotechnical investigation will be performed to characterize the roadway subgrade to support pavement section design. A pavement design summary and materials design report will be prepared to document the recommended pavement design, including projected traffic volumes and pavement design parameters and criteria. The final design of pavements will be performed in accordance with current ADOT Pavement Design Section guidance and recommendations.

**4.14 Landscaping and Aesthetics**

Landscaping is a standard feature of ADOT’s regional freeways. In consultation with the local agencies and neighboring communities, ADOT will develop a theme for aesthetic treatments applied to bridges and other freeway structures to help them blend into the surroundings. ADOT has expanded its palette of acceptable wall treatments to include thematic emblems or symbols and, in some cases, more than one color. ADOT Roadside Development staff will design the aesthetic treatments based on community input.

**4.15 Design Exceptions**

There will be no AASHTO nonconforming design elements within the project limits following construction of the recommended alternative; therefore, no design exceptions will be required.



5.0 Estimate of Probable Costs

The estimate of probable project costs for constructing the Ultimate Condition is \$133.8 million (2016 dollars). This estimate includes \$86.8 million for construction, \$5.3 million for design, \$10.3 million for ICAP, and \$31.4 million for right-of-way.

Two additional estimates for the Recommended Build Alternative have been developed for the phased implementation of the Interim and Ultimate Conditions. The estimate of probable project costs for constructing the Interim Condition is \$60.4 million (2016 dollars). This estimate includes \$48.3 million for construction, \$2.9 million for design, \$4.7 million for ICAP, and \$4.5 million for right-of-way. The estimated of probable cost for constructing the phased Ultimate Condition is \$81.5 million (2016 dollars). This estimate includes \$45.5 for construction, \$2.8 million for design, \$6.3 million for ICAP and \$26.9 million for right-of-way. The Order of Magnitude project cost estimates are presented in Appendix D. Tables 5-1, 5-2, and 5-3 summarize the total cost by major element.

Constructing the project in two separate phases will total \$141.9 million.

Unit cost information from recent ADOT construction projects was used to develop the estimate of probable cost.

The following is a general summary of the cost estimates being provided:

- Ultimate Condition – Includes corridor improvements from POE to Grand Avenue, grade-separated flyover for Ramp EN, grade-separated flyover for Ramp SW, and southbound I-19 exit ramp improvements.
- Interim Condition – Includes corridor improvements from POE to Grand Avenue, at-grade flyover for Ramp EN, and southbound I-19 exit ramp improvements.
- Phase Ultimate Condition – Includes reconstruction of Ramp EN previously constructed in the Interim Condition to provide a grade-separated flyover at Frank Reed Road, grade-separated flyover for Ramp SW, and southbound I-19 exit ramp improvements.

Table 5-1. Estimate of probable cost for Ultimate Condition

Item description	Cost (\$)
Earthwork	\$7,339,207
Base and surface treatment (paving)	\$3,425,114
Drainage	\$2,115,654
Structures	\$25,739,480
Traffic (signing, striping, signals, lighting)	\$6,138,352
Roadside development (landscape/aesthetics)	\$3,170,000
Incidentals	\$14,958,402
Subtotal A	\$62,886,000
Unidentified items (20% of Subtotal A)	\$12,577,000
Subtotal B (Subtotal A + unidentified items)	\$75,463,000
Construction engineering (10% of Subtotal B)	\$7,546,000
Construction contingencies (5% of Subtotal B)	\$3,773,000
Total estimated construction cost	\$86,782,000
Design (7% of Subtotal B)	\$5,282,000
Right-of-way	\$31,400,000
Subtotal other project costs	\$36,682,000
Indirect cost allocation (8.36%) of total construction and other project cost)	\$10,322,000
Total estimated project cost	\$133,786,000

Table 5-2. Estimate of probable cost for Interim Condition

Item description	Cost (\$)
Earthwork	\$3,970,090
Base and surface treatment (paving)	\$2,354,880
Drainage	\$2,356,654
Structures	\$10,579,725
Traffic (signing, striping, signals, lighting)	\$5,168,027
Roadside development (landscape/aesthetics)	\$3,170,000
Incidentals	\$7,421,942
Subtotal A	\$35,021,000
Unidentified items (20% of Subtotal A)	\$7,004,000
Subtotal B (Subtotal A + unidentified items)	\$42,025,000
Construction engineering (10% of Subtotal B)	\$4,203,000
Construction contingencies (5% of Subtotal B)	\$2,101,000
Total estimated construction cost	\$48,329,000
Design (7% of Subtotal B)	\$2,942,000
Right-of-way	\$4,500,000
Subtotal other project costs	\$7,442,000
Indirect cost allocation (8.36% of total construction and other project cost)	\$4,662,000
Total estimated project cost	\$60,433,000

Table 5-3. Estimate of probable cost for Phased Ultimate Condition

Item description	Cost (\$)
Earthwork	\$4,705,513
Base and surface treatment (paving)	\$2,317,890
Drainage	\$231,240
Structures	\$16,444,900
Traffic (signing, striping, signals, lighting)	\$3,298,492
Roadside development (landscape/aesthetics)	\$1,292,500
Incidentals	\$4,715,460
Subtotal A	\$33,006,000
Unidentified items (20% of Subtotal A)	\$6,601,000
Subtotal B (Subtotal A + unidentified items)	\$39,607,000
Construction engineering (10% of Subtotal B)	\$3,961,000
Construction contingencies (5% of Subtotal B)	\$1,980,000
Total estimated construction cost	\$45,548,000
Design (7% of Subtotal B)	\$2,772,000
Right-of-way	\$26,900,000
Subtotal other project costs	\$29,672,000
Indirect cost allocation (8.36%) of total construction and other project cost)	\$6,288,000
Total estimated project cost	\$81,508,000

Total Phased Project Cost: \$141,941,000

## 6.0 Social, Economic, and Environmental Considerations

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The EA, along with supporting technical reports, has been prepared for this project pending approval by ADOT and FHWA. Contained in the EA are mitigation measures to be incorporated into the project final design and construction documents. The mitigation measures listed in the EA are not subject to modification without prior written approval of FHWA.



## 7.0 References

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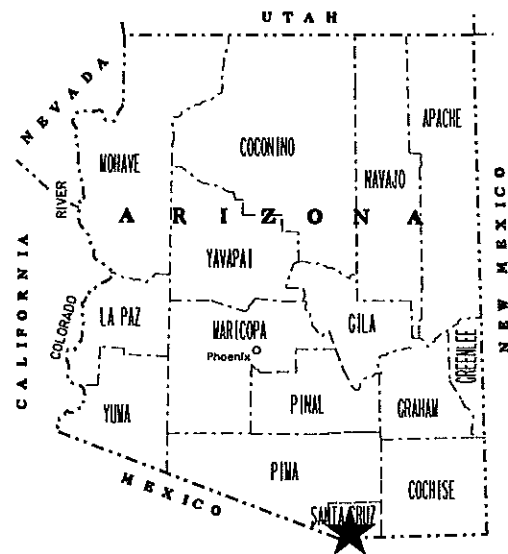
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**Appendix A. Recommended Build Alternative Plans**

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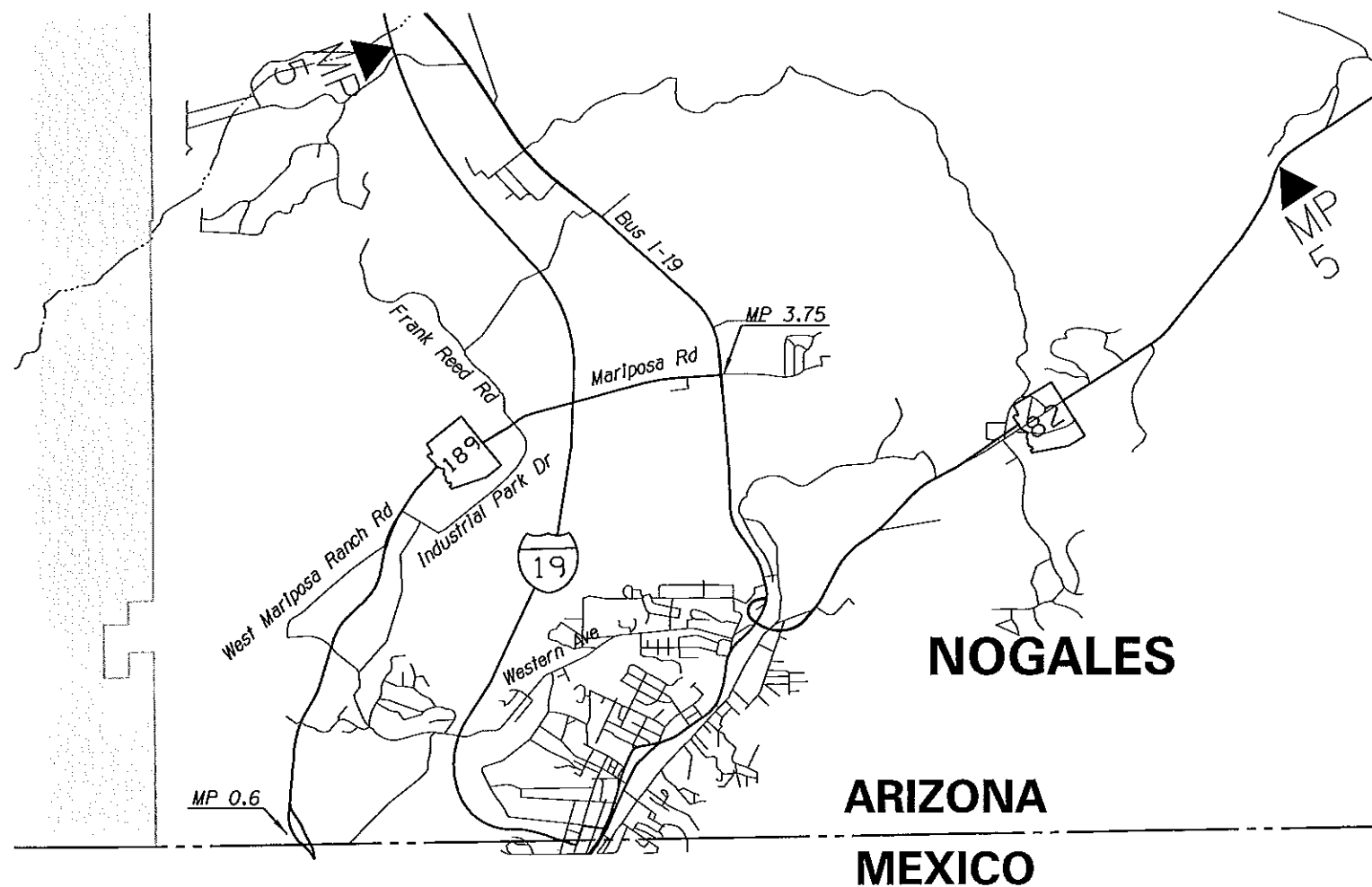
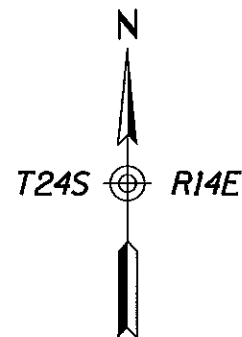
STATE OF ARIZONA  
DEPARTMENT OF TRANSPORTATION  
INTERMODAL TRANSPORTATION DIVISION

**ADOT**

PROJECT PLANS

STATE HIGHWAY  
NOGALES PRIMARY CONNECTION  
SR 189

CORRIDOR IMPROVEMENTS



Constructed by:

Construction Company

Completion Date

Red-Lines by:

Construction Administrator Name & Company

Completion Date

Record Drawings by:

Record Drawings Designer Name & Company

Completion Date

INTERNATIONAL BORDER TO GRAND AVENUE

PROJECT NO. 189 SC 000 H8045 01L  
FEDERAL AID NO. STP-189-A(201)T

ARIZONA DEPARTMENT OF TRANSPORTATION  
INTERMODAL TRANSPORTATION DIVISION  
DALLAS HAMMIT, P.E., STATE ENGINEER

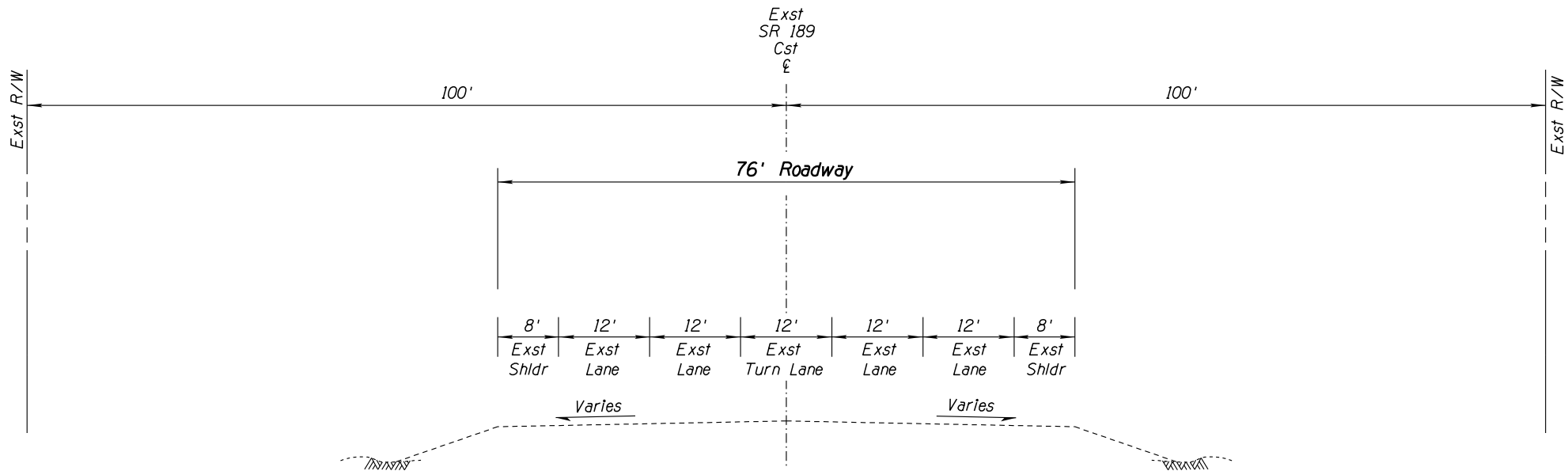
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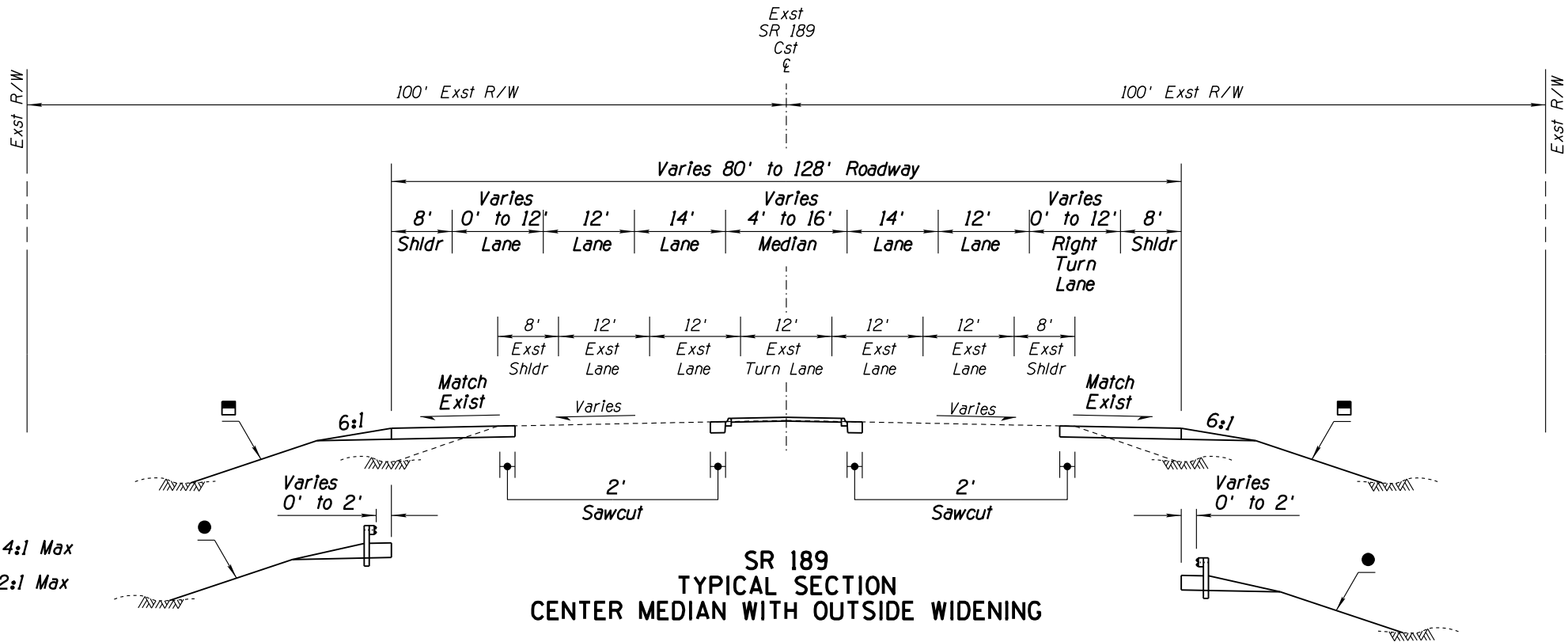
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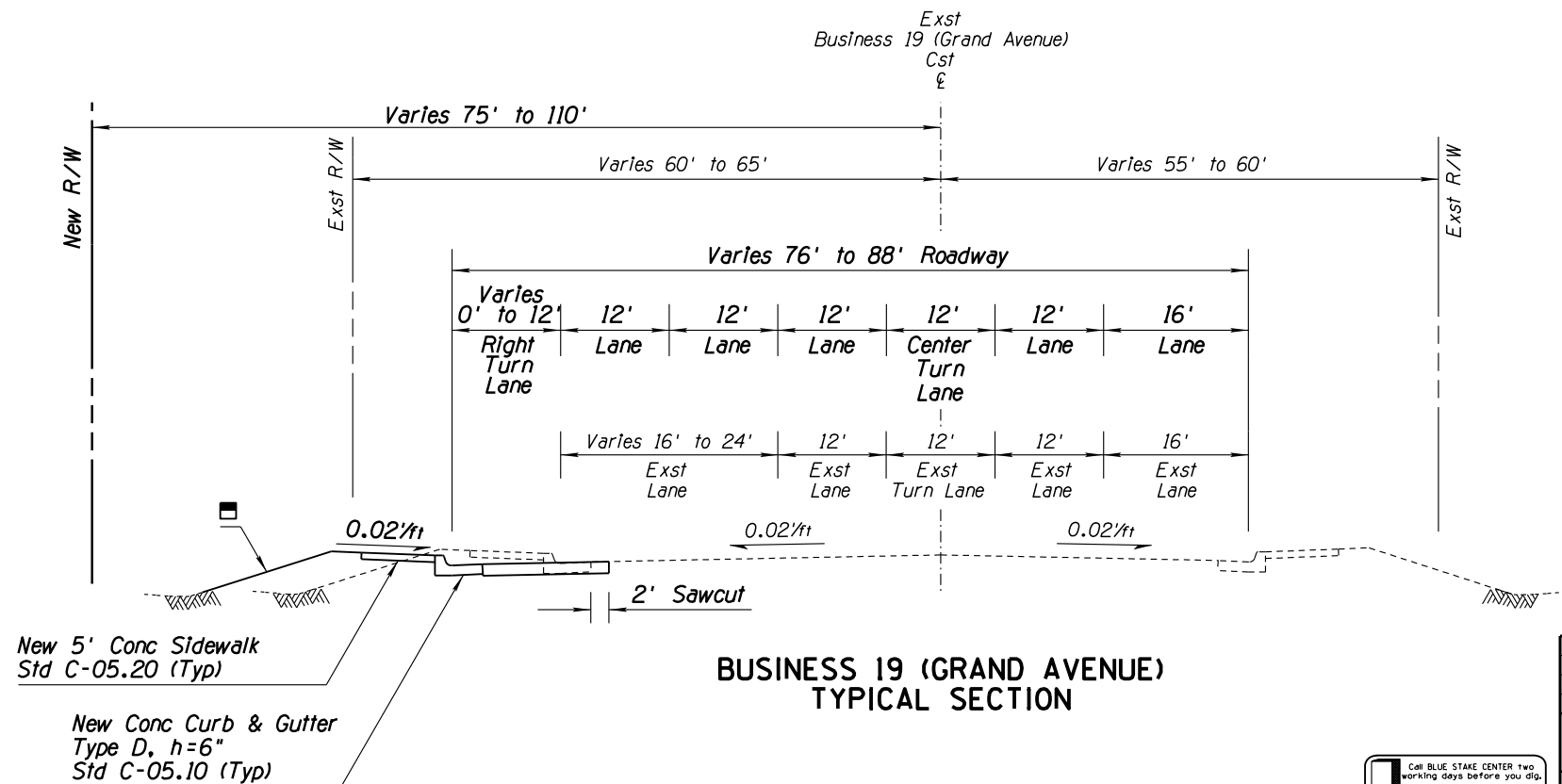
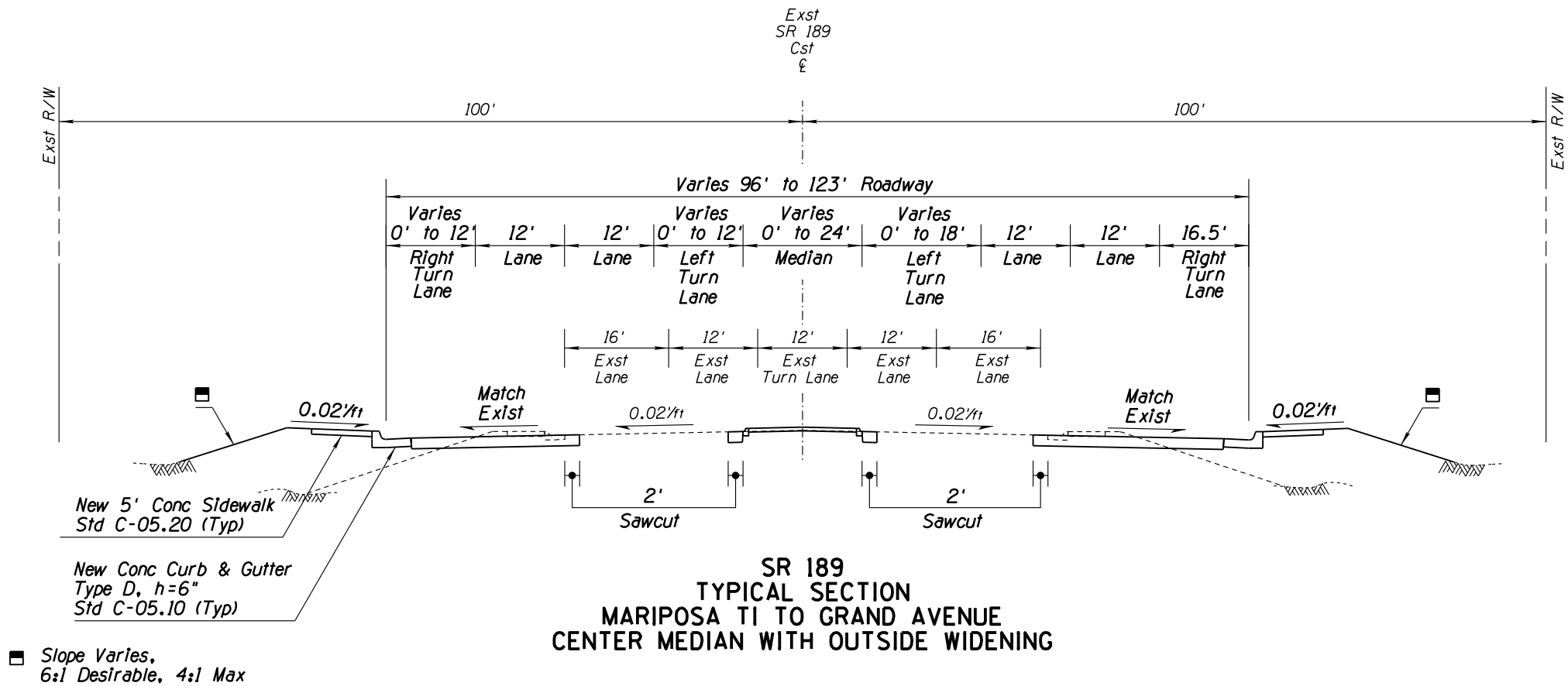
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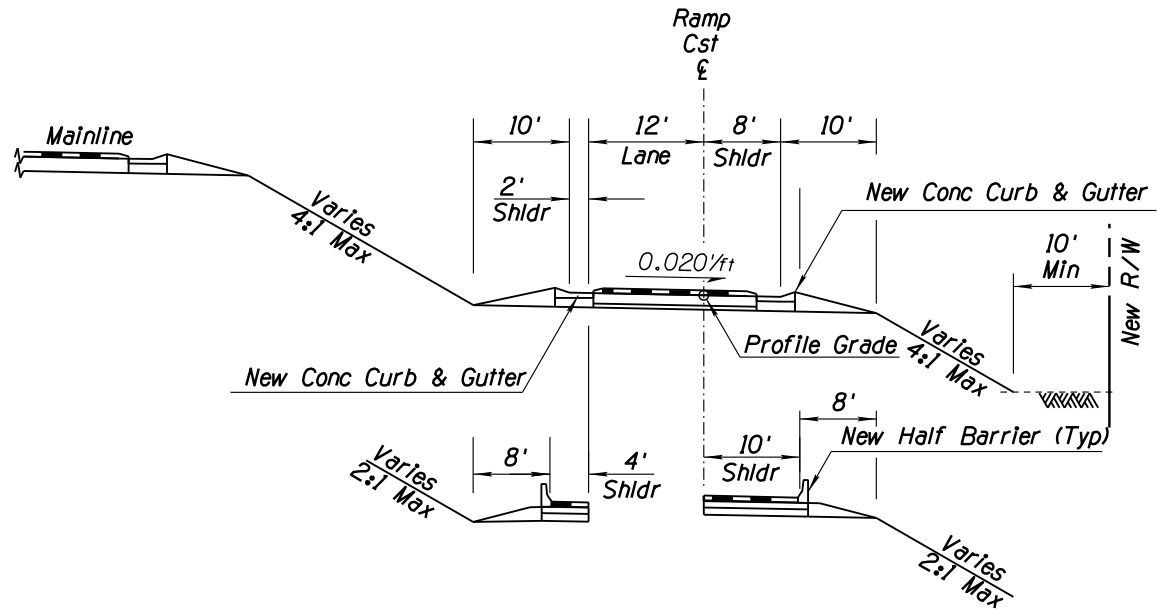
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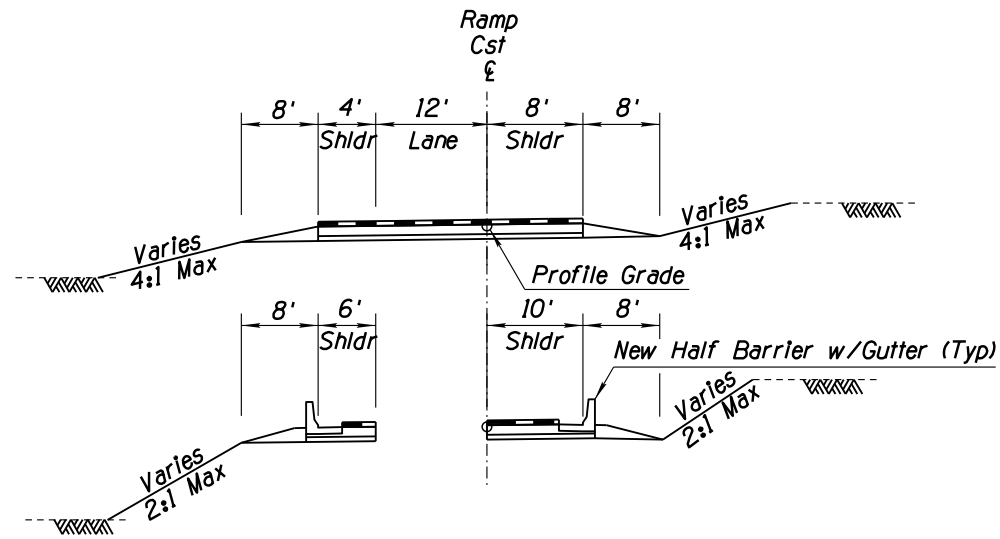
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TYPICAL SECTION - ONE LANE DIRECTIONAL RAMP  
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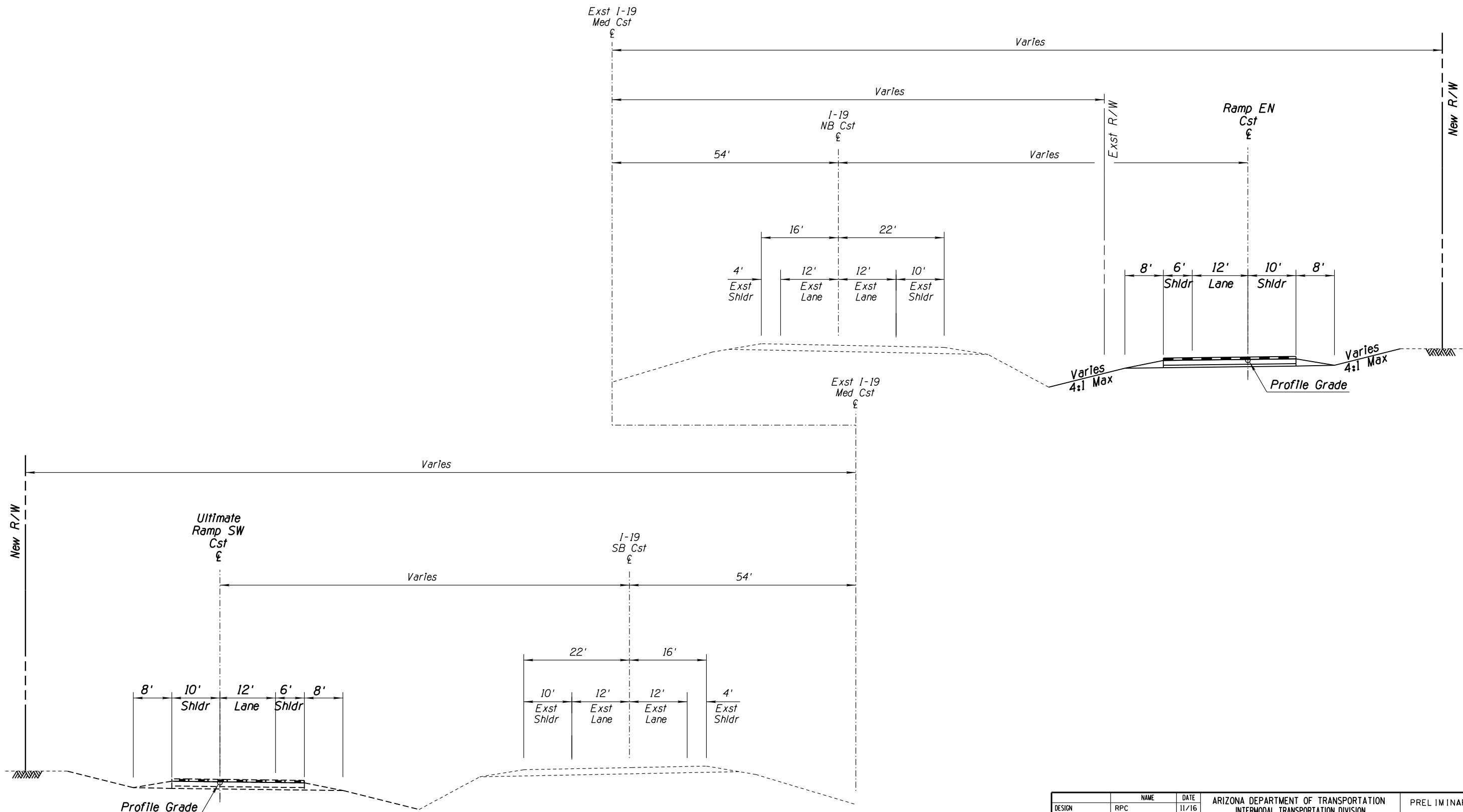
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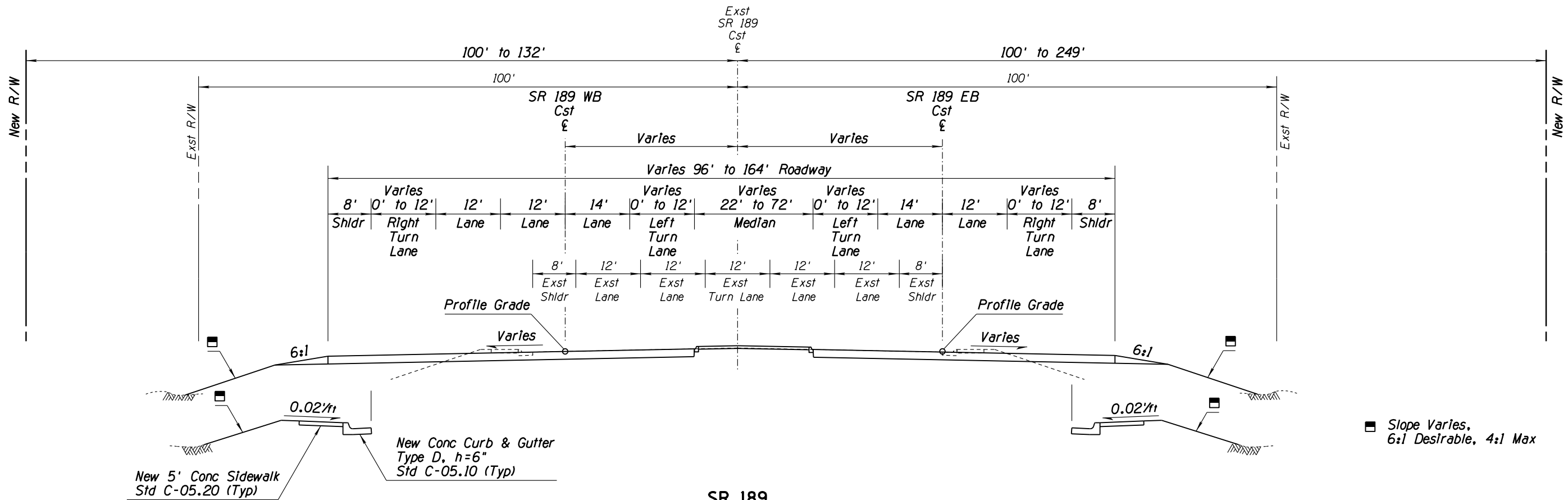


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SR 189  
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FULL RECONSTRUCTION

■ Slope Varies,  
6:1 Desirable, 4:1 Max

PHASED ULTIMATE CONFIGURATION

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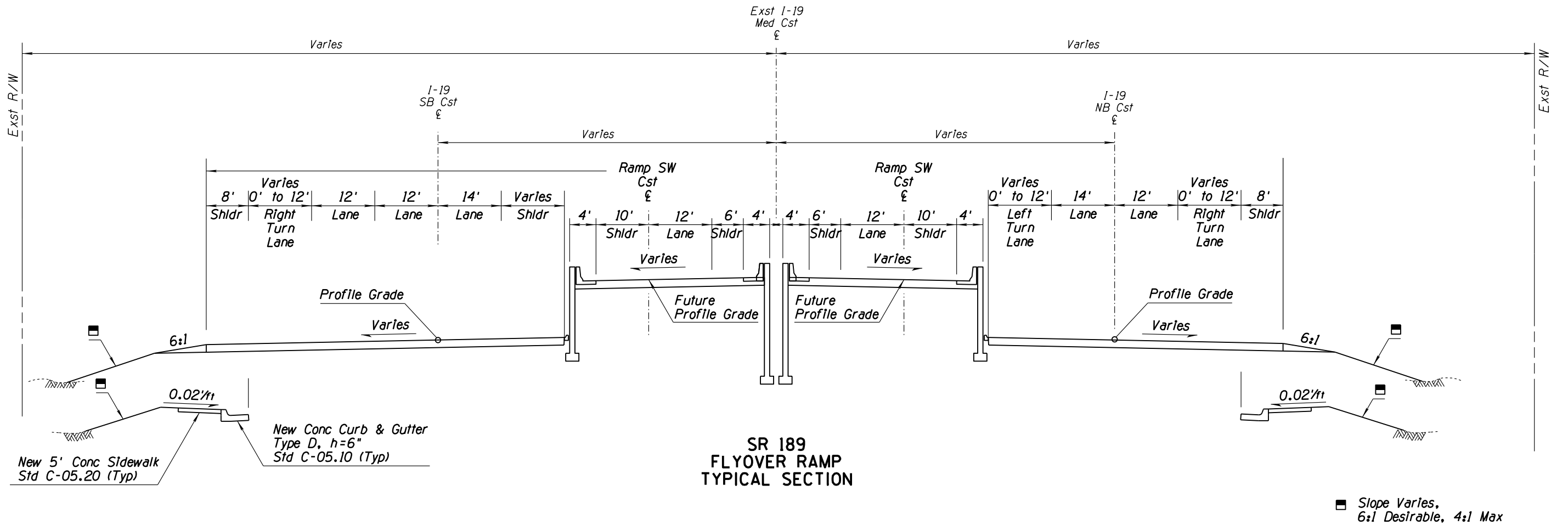




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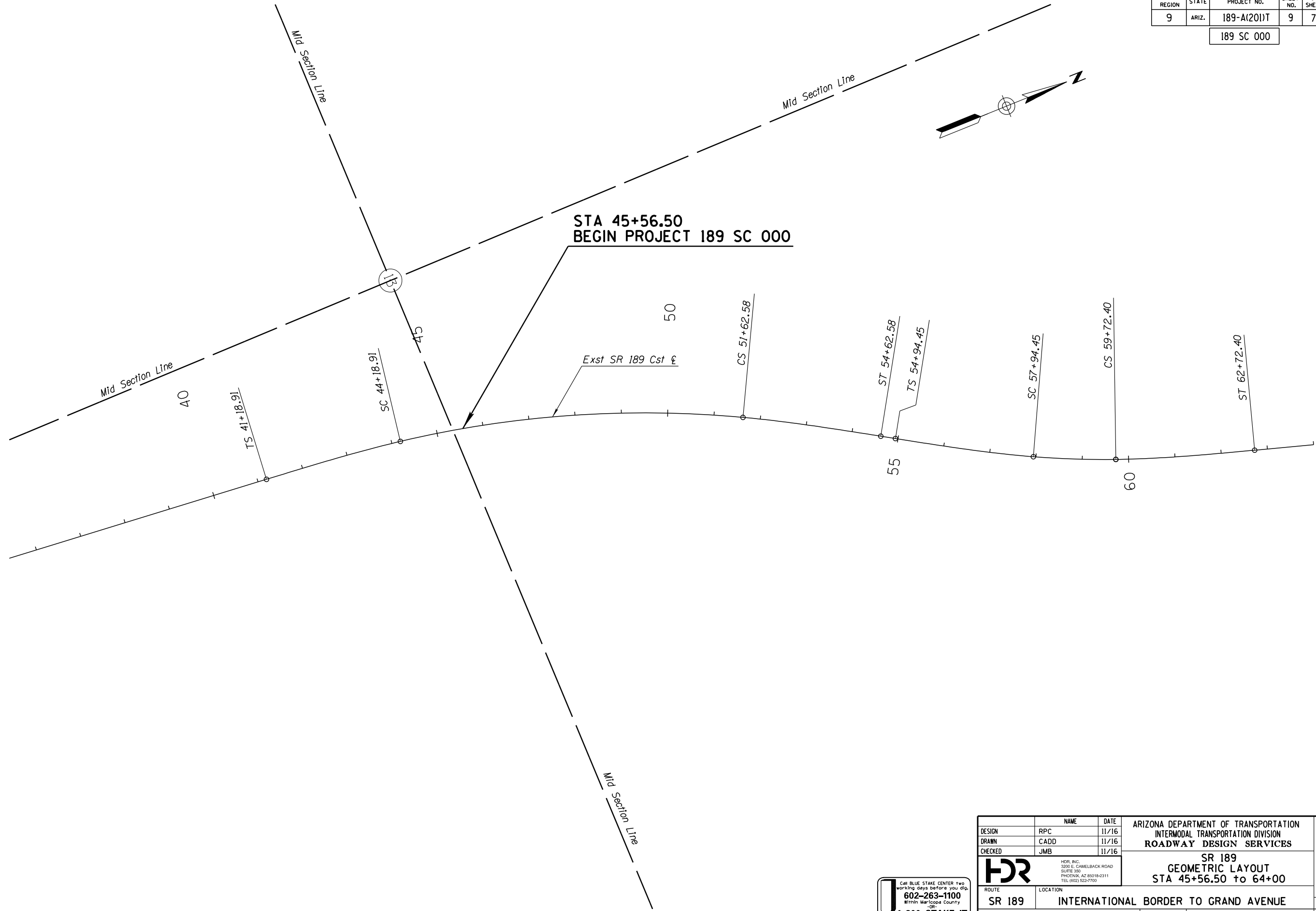
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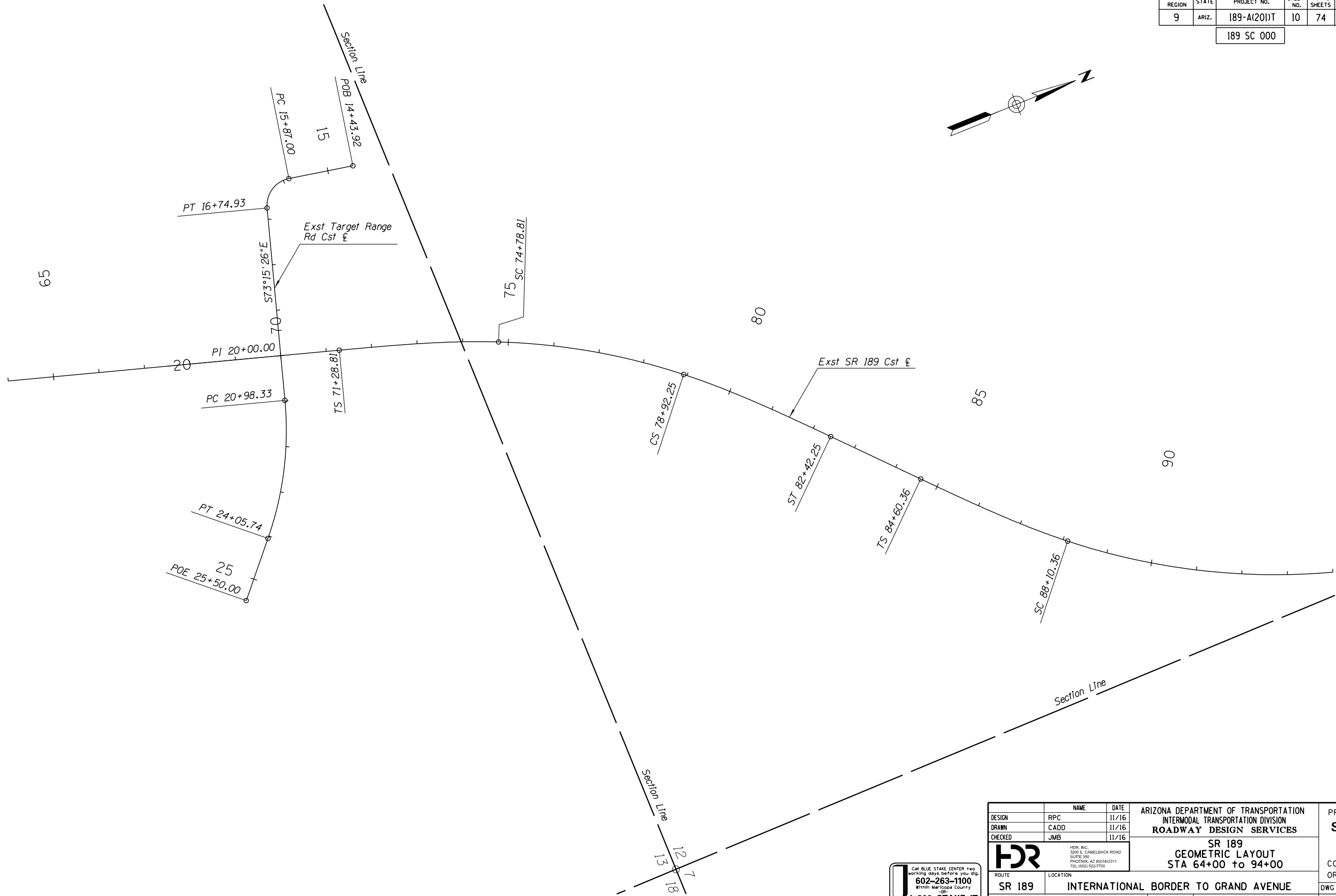
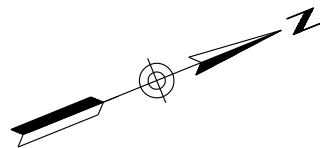
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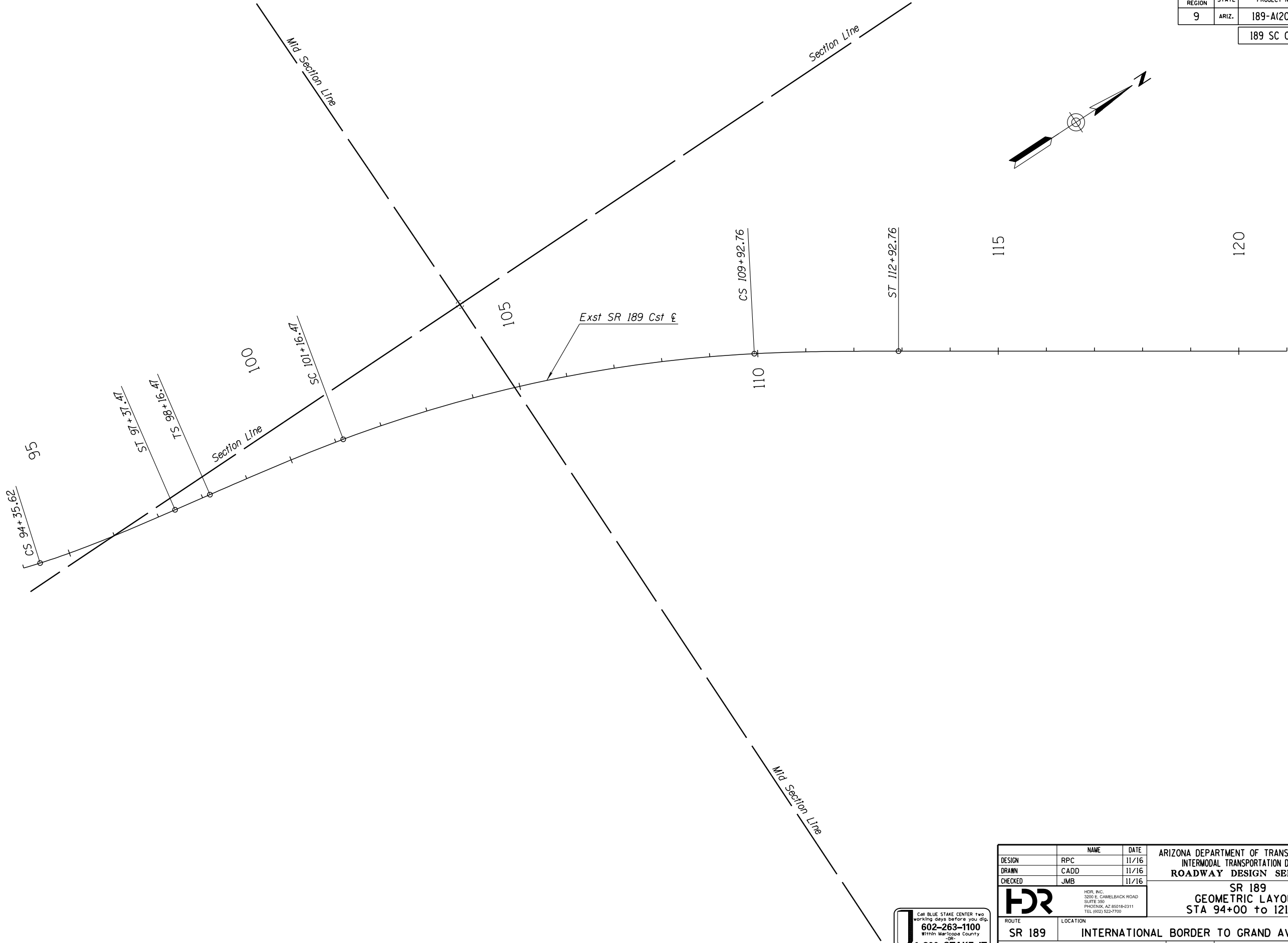
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				___ OF ___	

F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	RECORD DRAWING
9	ARIZ.	189-A(20)IT	11	74	
189 SC 000					



		NAME		DATE		ARIZONA DEPARTMENT OF TRANSPORTATION INTERMODAL TRANSPORTATION DIVISION ROADWAY DESIGN SERVICES	PRELIMINARY <b>STAGE II</b> Review NOT FOR CONSTRUCTION OR RECORDING
DESIGN		RPC		11/16			
DRAWN		CADD		11/16			
CHECKED		JMB		11/16			
		HDR, INC. 3200 E. CAMELBACK ROAD SUITE 300 PHOENIX, AZ 85018-0311 TEL (602) 520-7190				SR 189 GEOMETRIC LAYOUT STA 94+00 to 121+00	
ROUTE		LOCATION				DWG NO. G-03.03	
SR 189		INTERNATIONAL BORDER TO GRAND AVENUE					
TRACS NO. H8045 OIL				189-SC-000		___ OF ___	



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TIME: 10:15:21 AM  
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PLOT BY: AHOFFMAN  
DATE: LOCATION: REVISIONS: FINISHED PLANS: SURVEY NO. DATE: LOCATION: REVISIONS: FINISHED PLANS: SURVEY NO.

F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	RECORD DRAWING
9	ARIZ.	189-A(20)IT	12	74	
189 SC 000					


1 CURVE DATA  
PI Sta 301+42.46  
Main Curve  
 $\Delta = 11^{\circ}12'42''$  Rt  
 $D = 3^{\circ}56'52''$   
 $R = 1451.39'$   
 $L = 284.01'$   
 $T = 142.46'$   
 $Ext = 6.97'$   
 $Super = 0.049'/ft$

2 CURVE DATA  
PI Sta 307+91.96  
Main Curve  
 $\Delta = 28^{\circ}11'20''$  Lt  
 $D = 5^{\circ}05'03''$   
 $R = 1126.92'$   
 $L = 554.43'$   
 $T = 282.95'$   
 $Ext = 34.98'$   
 $Super = 0.054'/ft$

3 CURVE DATA  
PI Sta 84+94.29  
Main Curve  
 $\Delta = 39^{\circ}54'02''$  Rt  
 $D = 4^{\circ}03'14''$   
 $R = 1413.39'$   
 $L = 984.28'$   
 $T = 513.04'$   
 $Ext = 90.23'$   
 $Super = 0.044'/ft$

4 CURVE DATA  
PI Sta 93+83.66  
Main Curve  
 $\Delta = 18^{\circ}49'33''$  Lt  
 $D = 4^{\circ}55'06''$   
 $R = 1164.92'$   
 $L = 382.76'$   
 $T = 193.12'$   
 $Ext = 15.90'$   
 $Super = 0.044'/ft$



		NAME		DATE		ARIZONA DEPARTMENT OF TRANSPORTATION INTERMODAL TRANSPORTATION DIVISION ROADWAY DESIGN SERVICES  SR 189 GEOMETRIC LAYOUT STA 121+00 to 150+00			PRELIMINARY		
DESIGN		RPC		11/16					STAGE II		
DRAWN		CADD		11/16					Review		
CHECKED		JMB		11/16					NOT FOR CONSTRUCTION OR RECORDING		
						HDR, INC. 3200 E. CAMELBACK ROAD SUITE 100 PHOENIX, AZ 85018-2311 TEL: (602) 522-7700					
ROUTE		LOCATION		SR 189 INTERNATIONAL BORDER TO GRAND AVENUE						DWG NO. G-03.04	
SR 189											
TRACS NO. H8045 OIL						189-SC-000				OF	

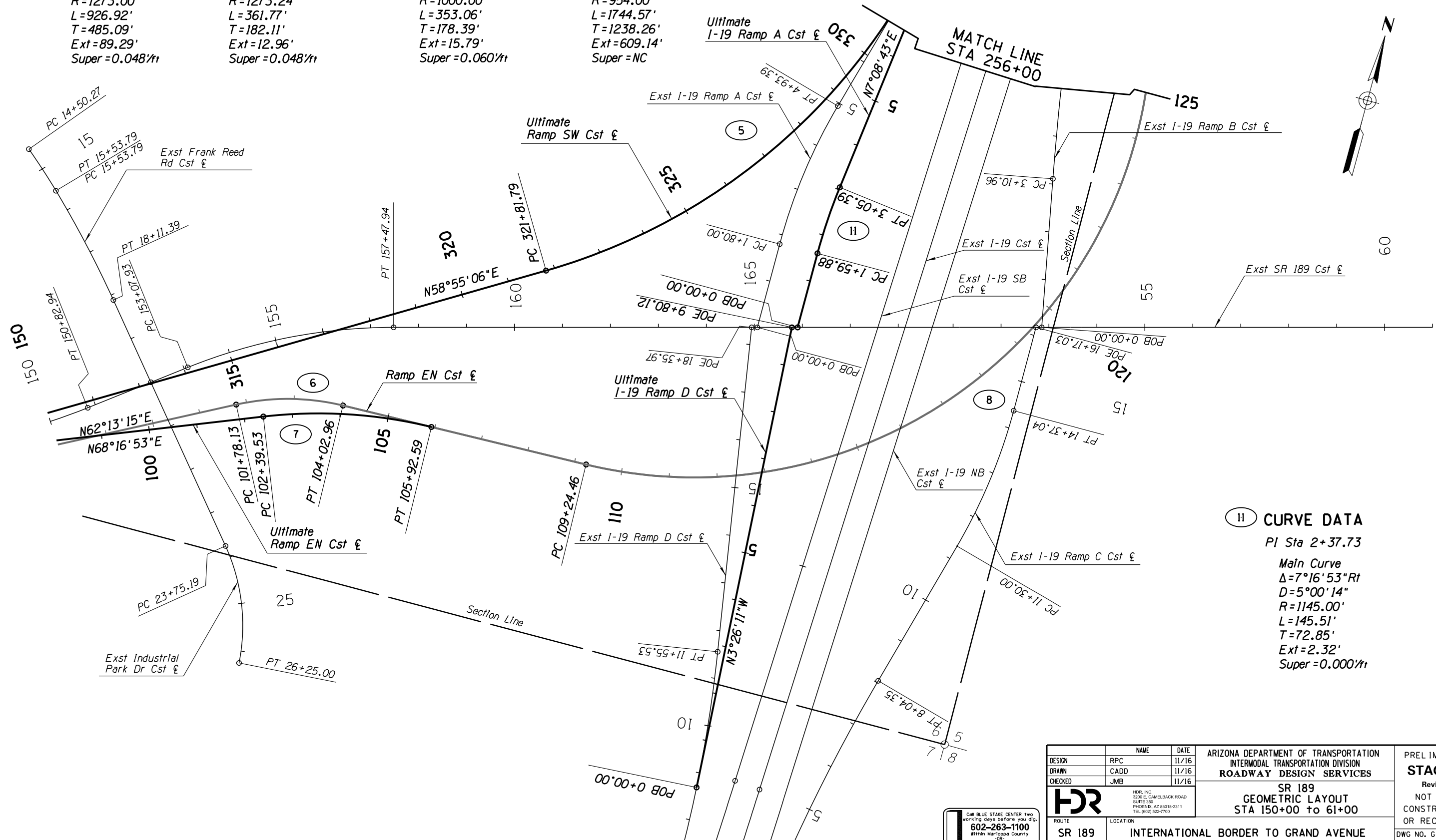
5 CURVE DATA  
PI Sta 326+66.88  
Main Curve  
 $\Delta = 41^\circ 43' 10''$  Lt  
 $D = 4^\circ 30' 03''$   
 $R = 1273.00'$   
 $L = 926.92'$   
 $T = 485.09'$   
 $Ext = 89.29'$   
 $Super = 0.048'/ft$

6 CURVE DATA  
PI Sta 102+92.56  
Main Curve  
 $\Delta = 16^\circ 16' 46''$  Rt  
 $D = 4^\circ 30' 00''$   
 $R = 1273.24'$   
 $L = 361.77'$   
 $T = 182.11'$   
 $Ext = 12.96'$   
 $Super = 0.048'/ft$


7 CURVE DATA  
PI Sta 104+17.92  
Main Curve  
 $\Delta = 20^\circ 13' 44''$  Rt  
 $D = 5^\circ 43' 46''$   
 $R = 1000.00'$   
 $L = 353.06'$   
 $T = 178.39'$   
 $Ext = 15.79'$   
 $Super = 0.060'/ft$

8 CURVE DATA  
PI Sta 121+62.72  
Main Curve  
 $\Delta = 104^\circ 46' 33''$  Lt  
 $D = 6^\circ 00' 21''$   
 $R = 954.00'$   
 $L = 1744.57'$   
 $T = 1238.26'$   
 $Ext = 609.14'$   
 $Super = NC$

F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	RECORD DRAWING
9	ARIZ.	189-A(20)IT	13	74	
189 SC 000					



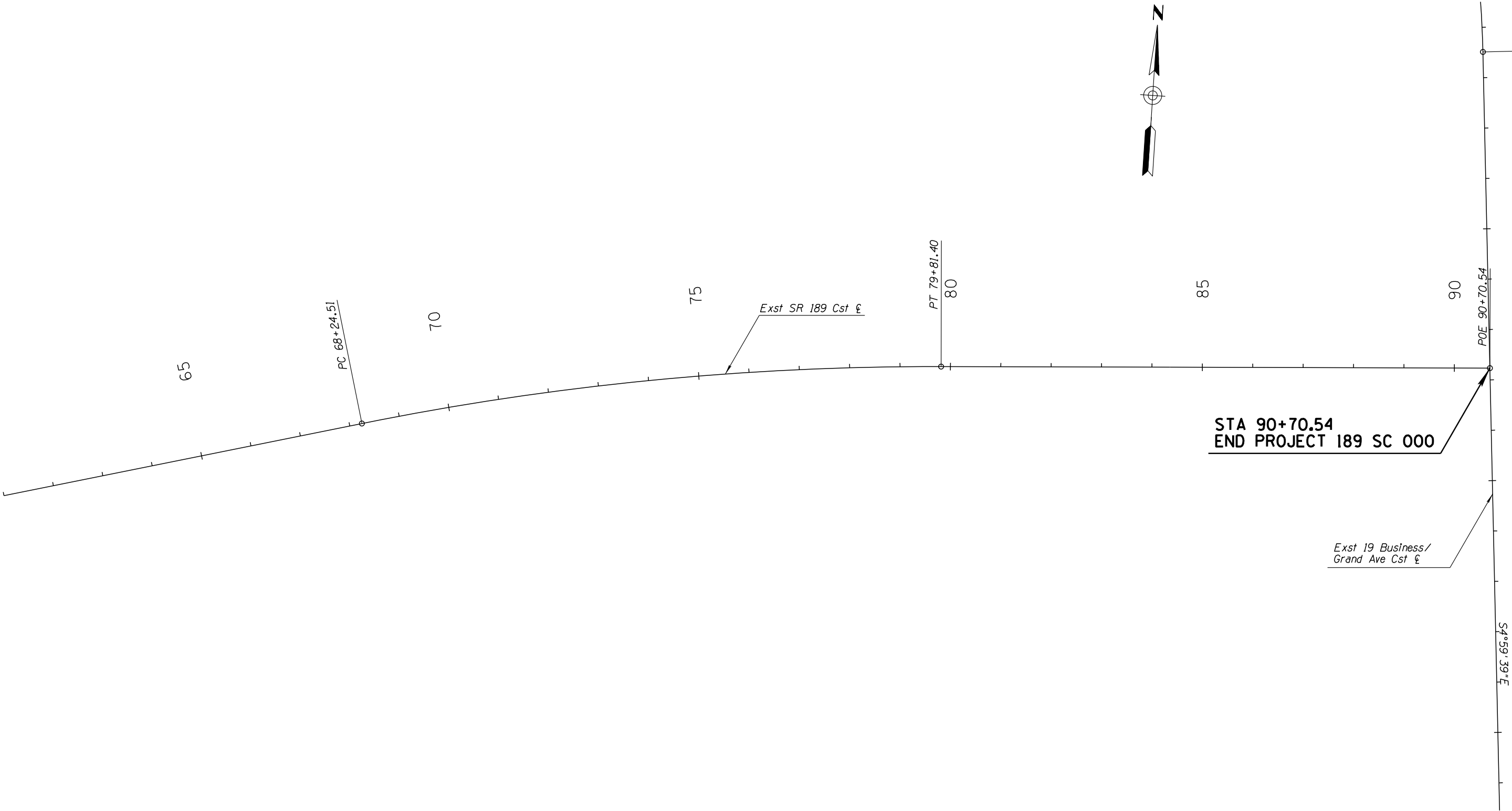
11 CURVE DATA  
PI Sta 2+37.73  
Main Curve  
 $\Delta = 7^\circ 16' 53''$  Rt  
 $D = 5^\circ 00' 14''$   
 $R = 1145.00'$   
 $L = 145.51'$   
 $T = 72.85'$   
 $Ext = 2.32'$   
 $Super = 0.000'/ft$


		NAME	DATE	ARIZONA DEPARTMENT OF TRANSPORTATION INTERMODAL TRANSPORTATION DIVISION ROADWAY DESIGN SERVICES		PRELIMINARY	
DESIGN		RPC	11/16			STAGE II Review NOT FOR CONSTRUCTION OR RECORDING	
DRAWN		CADD	11/16				
CHECKED		JMB	11/16				
		HDR, INC. 3200 E. GAMBELBACK ROAD SUITE 150 PHOENIX, AZ 85016-0311 TEL (602) 522-7700		SR 189 GEOMETRIC LAYOUT STA 150+00 to 61+00			
ROUTE		LOCATION		SR 189 INTERNATIONAL BORDER TO GRAND AVENUE		DWG NO. G-03.05	
SR 189							
TRACS NO. H8045 OIL					189-SC-000	___ OF ___	



F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	RECORD DRAWING
9	ARIZ.	189-A(20)IT	14	74	

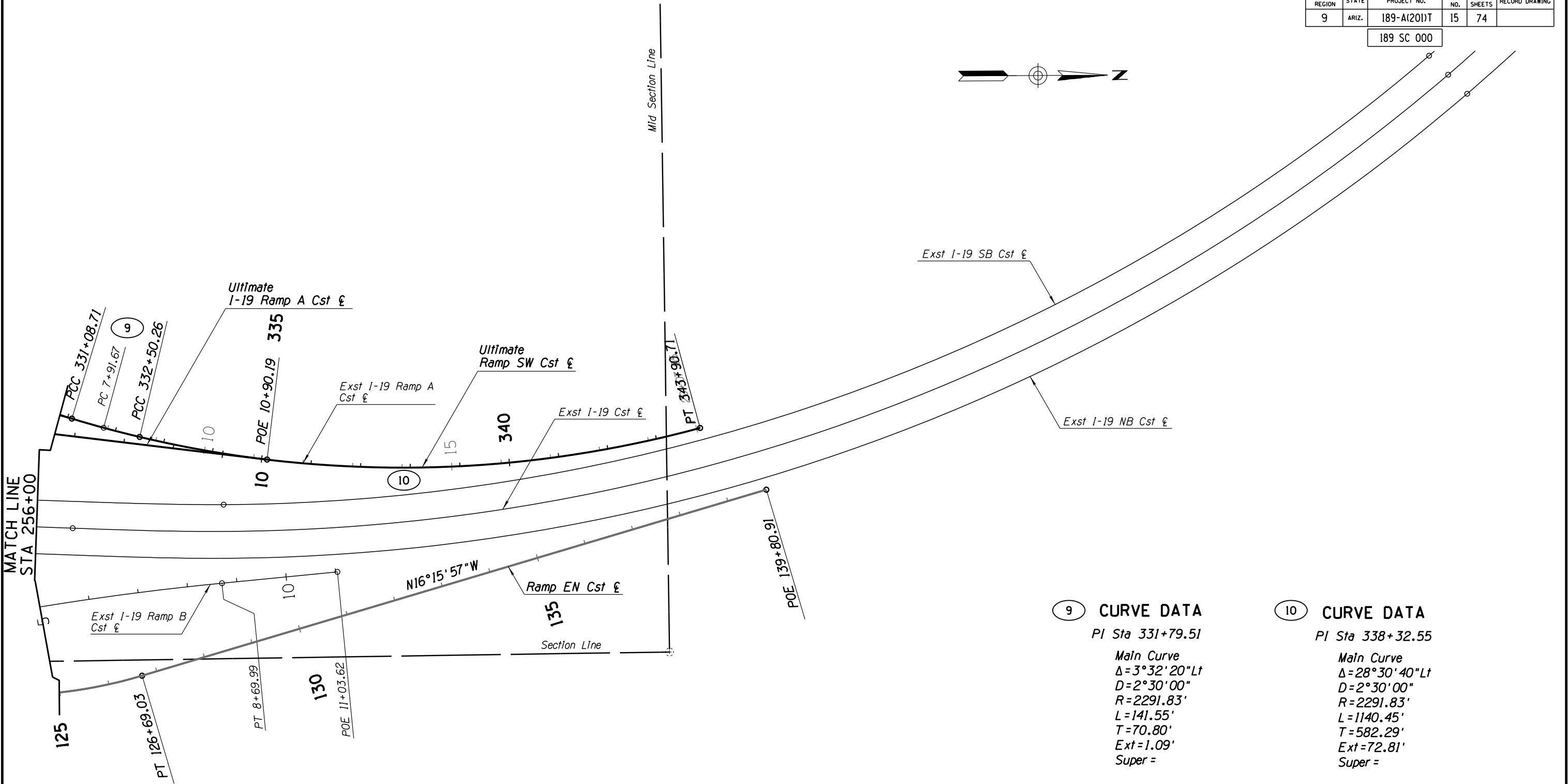
189 SC 000



		NAME		DATE		ARIZONA DEPARTMENT OF TRANSPORTATION INTERMODAL TRANSPORTATION DIVISION ROADWAY DESIGN SERVICES		PRELIMINARY <b>STAGE II</b> Review NOT FOR CONSTRUCTION OR RECORDING	
DESIGN		RPC		11/16					
DRAWN		CADD		11/16					
CHECKED		JMB		11/16					
		HDR, INC. 3200 E. CAMELBACK ROAD SUITE 300 PHOENIX, AZ 85018-2311 TEL: (602) 522-7700				SR 189 GEOMETRIC LAYOUT STA 61+00 to 90+70.54			
		ROUTE		LOCATION					
SR 189		INTERNATIONAL BORDER TO GRAND AVENUE						DWG NO. G-03.06	
TRACS NO. H8045 OIL				189-SC-000				___ OF ___	

F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	RECORD DRAWING
9	ARIZ.	189-A(20)IT	15	74	


189 SC 000



**9 CURVE DATA**  
PI Sta 331+79.51  
Main Curve  
Δ=3°32'20"Lt  
D=2°30'00"  
R=2291.83'  
L=141.55'  
T=70.80'  
Ext=1.09'  
Super =

**10 CURVE DATA**  
PI Sta 338+32.55  
Main Curve  
Δ=28°30'40"Lt  
D=2°30'00"  
R=2291.83'  
L=1140.45'  
T=582.29'  
Ext=72.81'  
Super =



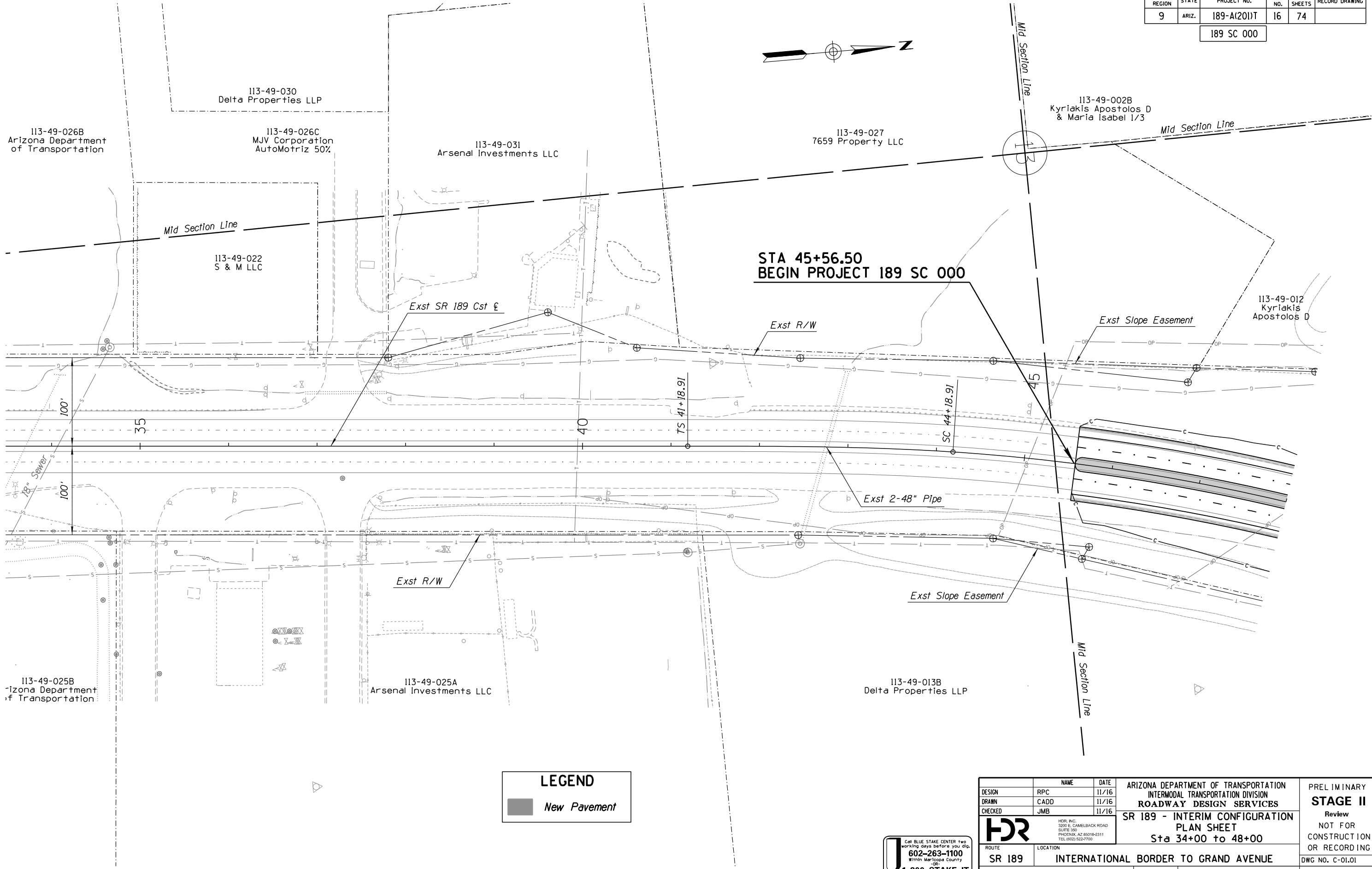
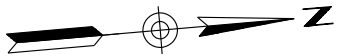
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DESIGN		RPC		11/16					
DRAWN		CADD		11/16					
CHECKED		JMB		11/16					
		HDR, INC. 3200 E. CAMELBACK ROAD SUITE 350 PHOENIX, AZ 85018-2311 TEL: (602) 522-7700				I-19 GEOMETRIC LAYOUT STA 256+00 to 285+00			
ROUTE		LOCATION						DWG NO. G-03.07	
SR 189		INTERNATIONAL BORDER TO GRAND AVENUE							
TRACS NO. H8045 OIL						189-SC-000		___ OF ___	



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REVISIONS: \_\_\_\_\_  
FINISHED PLANS: \_\_\_\_\_  
SURVEY NO. \_\_\_\_\_

F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	RECORD DRAWING
9	ARIZ.	189-A(20)IT	16	74	

189 SC 000



LEGEND

New Pavement


Call BLUE STAKE CENTER two working days before you dig.

602-263-1100

Within Maricopa County

1-800-STAKE-IT

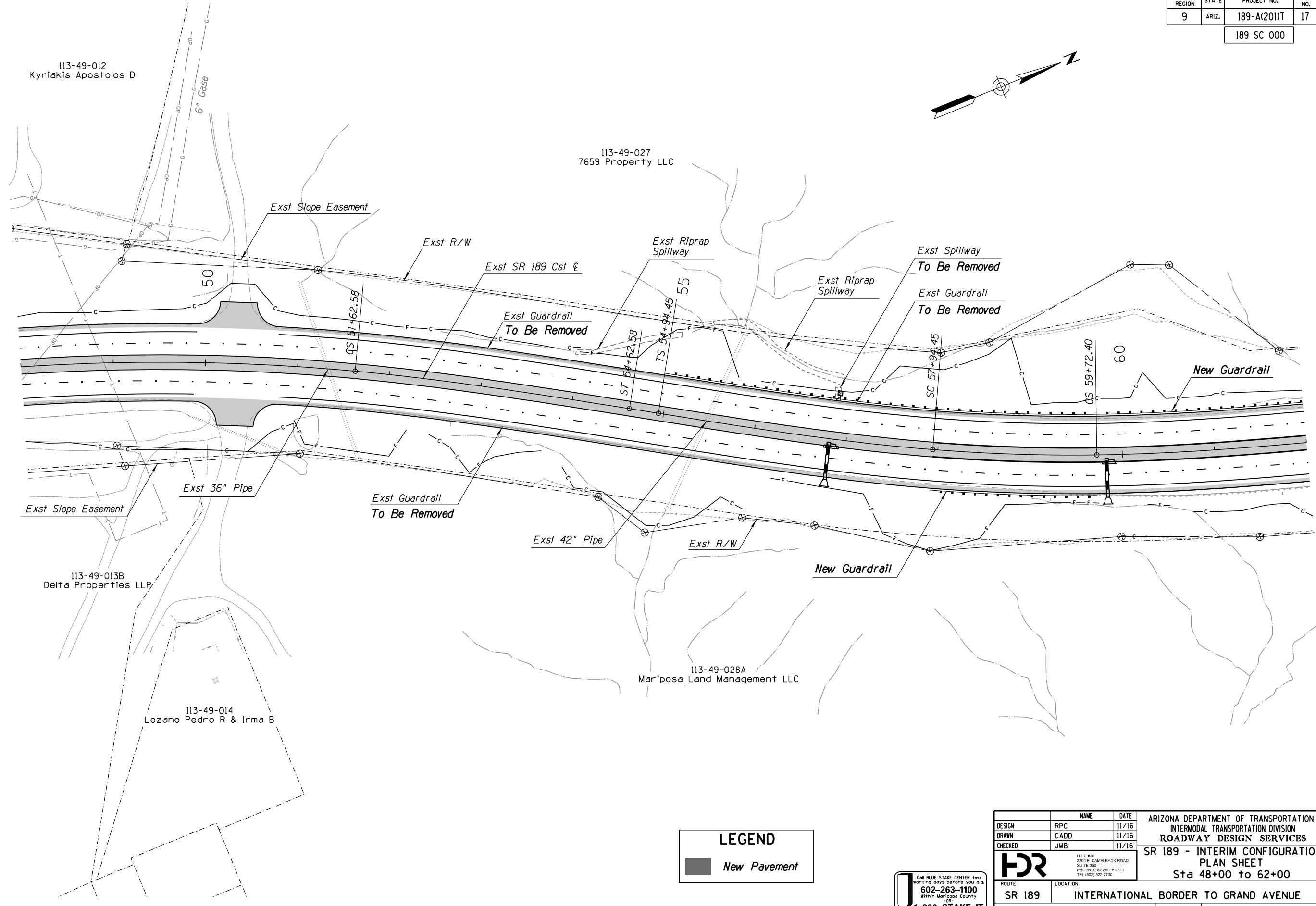
1782-55481

		NAME	DATE	ARIZONA DEPARTMENT OF TRANSPORTATION INTERMODAL TRANSPORTATION DIVISION ROADWAY DESIGN SERVICES		PRELIMINARY <b>STAGE II</b> Review NOT FOR CONSTRUCTION OR RECORDING DWG NO. C-01.01
DESIGN		RPC	11/16			
DRAWN		CADD	11/16			
CHECKED		JMB	11/16			
		HDR, INC. 3200 E. CAMELBACK ROAD SUITE 100 PHOENIX, AZ 85018-2311 TEL: (602) 522-7700		SR 189 - INTERIM CONFIGURATION PLAN SHEET Sta 34+00 to 48+00		
		ROUTE	LOCATION			
SR 189		INTERNATIONAL BORDER TO GRAND AVENUE				
TRACS NO. H8045 OIL			189-SC-000			___ OF ___

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F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	RECORD DRAWING
9	ARIZ.	189-A(20)IT	17	74	

189 SC 000



LEGEND

New Pavement


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602-263-1100

Within Maricopa County

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(782-5548)

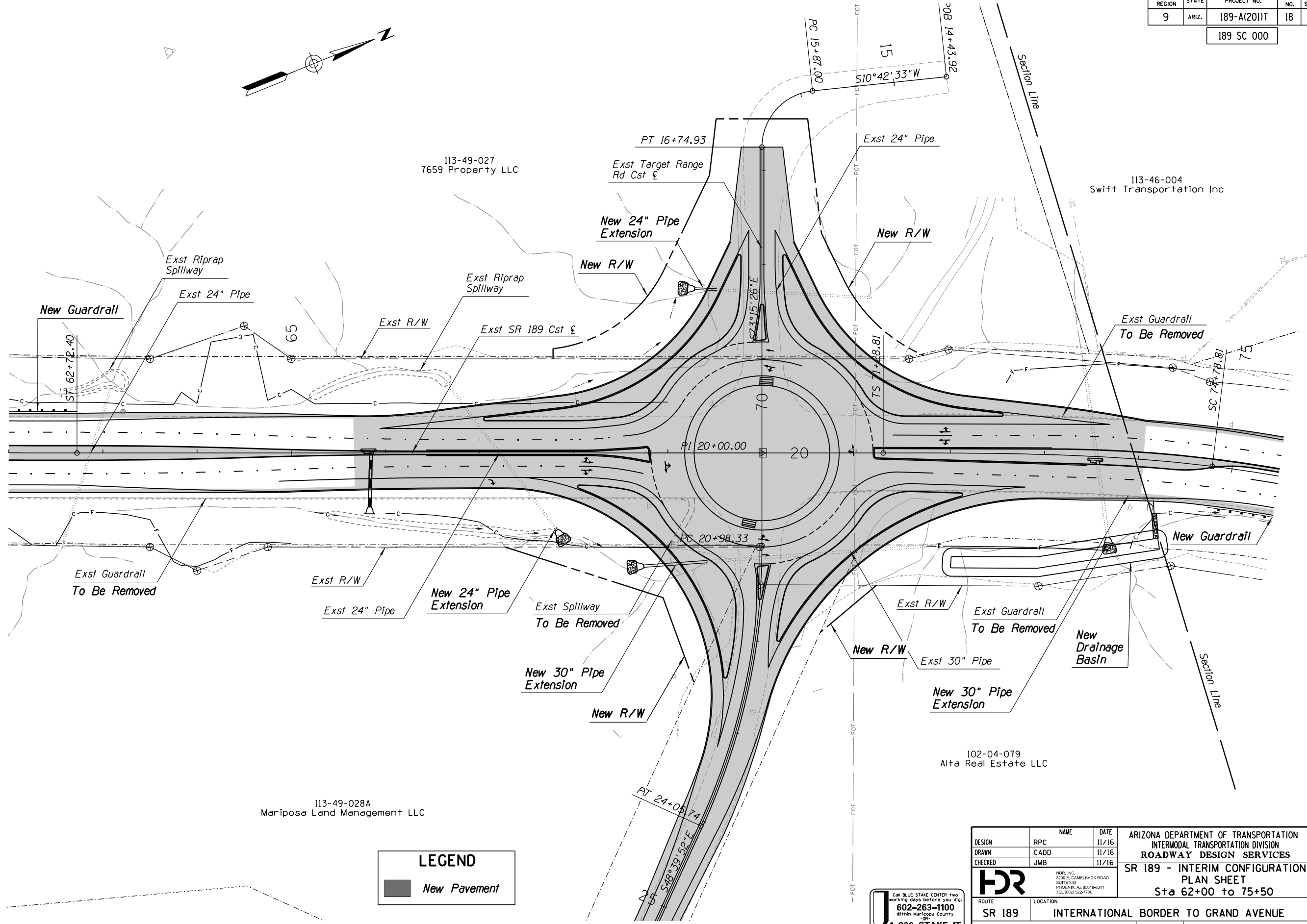
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DESIGN		RPC	11/16			
DRAWN		CADD	11/16			
CHECKED		JMB	11/16	SR 189 - INTERIM CONFIGURATION PLAN SHEET Sta 48+00 to 62+00		
		HDR, INC. 3200 E. CAMELBACK ROAD SUITE 350 PHOENIX, AZ 85018-2311 TEL (602) 522-7799				
ROUTE		LOCATION				
SR 189		INTERNATIONAL BORDER TO GRAND AVENUE				DWG NO. C-01.02
TRACS NO. H8045 OIL				189-SC-000		___ OF ___

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SURVEY NO. FINISHED PLANS. REVISIONS. LOCATION. DATE.

F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	RECORD DRAWING
9	ARIZ.	189-A(20)IT	18	74	


189 SC 000



LEGEND

New Pavement

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Within Maricopa County  
OR  
1-800-STAKE-IT  
1782-55481

		NAME	DATE	ARIZONA DEPARTMENT OF TRANSPORTATION INTERMODAL TRANSPORTATION DIVISION ROADWAY DESIGN SERVICES SR 189 - INTERIM CONFIGURATION PLAN SHEET Sta 62+00 to 75+50	PRELIMINARY <b>STAGE II</b> Review NOT FOR CONSTRUCTION OR RECORDING
DESIGN		RPC	11/16		
DRAWN		CADD	11/16		
CHECKED		JMB	11/16		
 <div>HDR, INC. 3200 E. CAMELBACK ROAD SUITE 300 PHOENIX, AZ 85018-2311 TEL. (602) 962-7700</div>					
ROUTE		LOCATION			
SR 189		INTERNATIONAL BORDER TO GRAND AVENUE		DWG NO. C-01.03	
TRACS NO. H8045 OIL				189-SC-000	___ OF ___



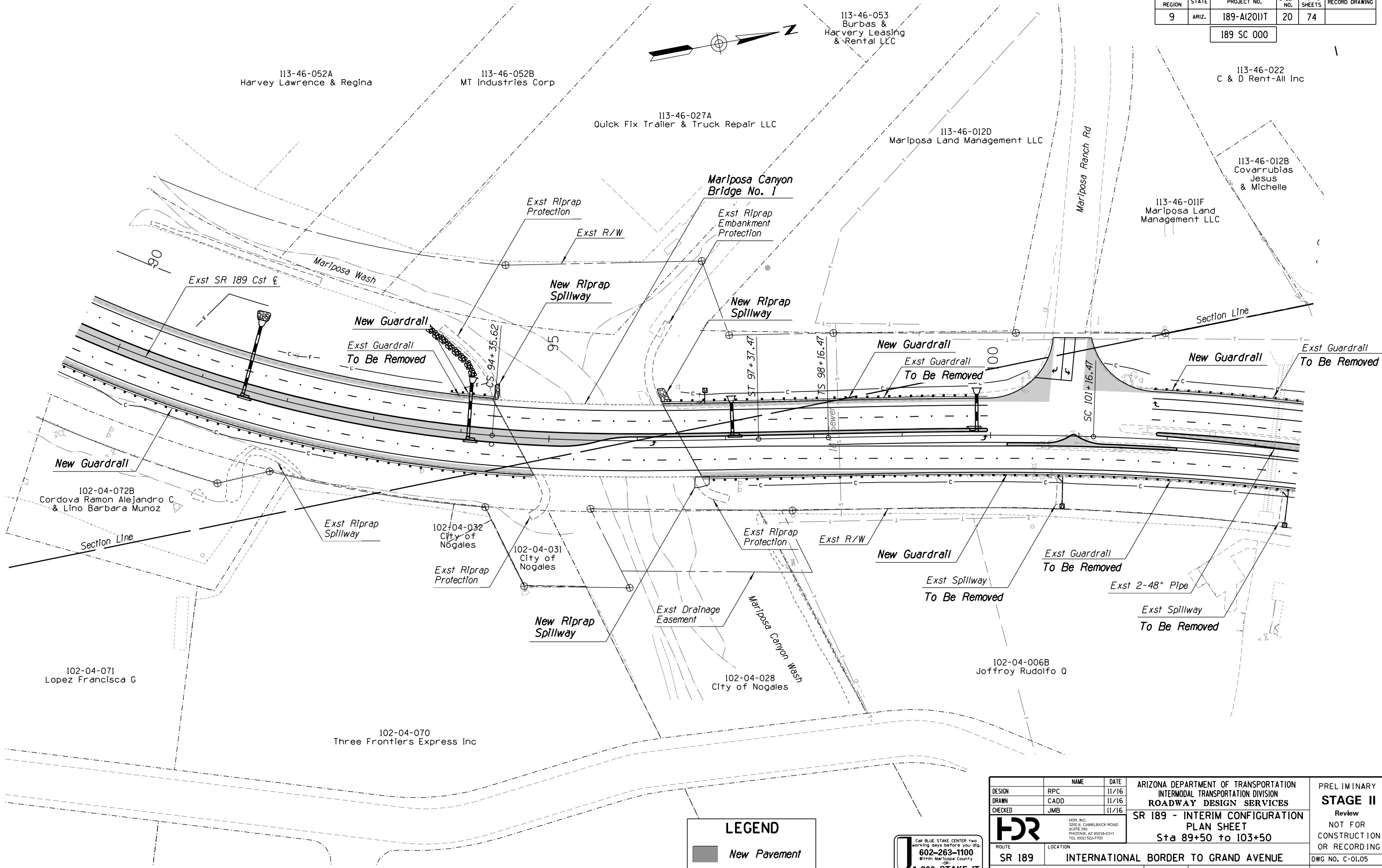


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SURVEY NO. FINISHED PLANS REVISIONS DATE LOCATION

F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	RECORD DRAWING
9	ARIZ.	189-A(20)IT	20	74	


189 SC 000



**LEGEND**

New Pavement

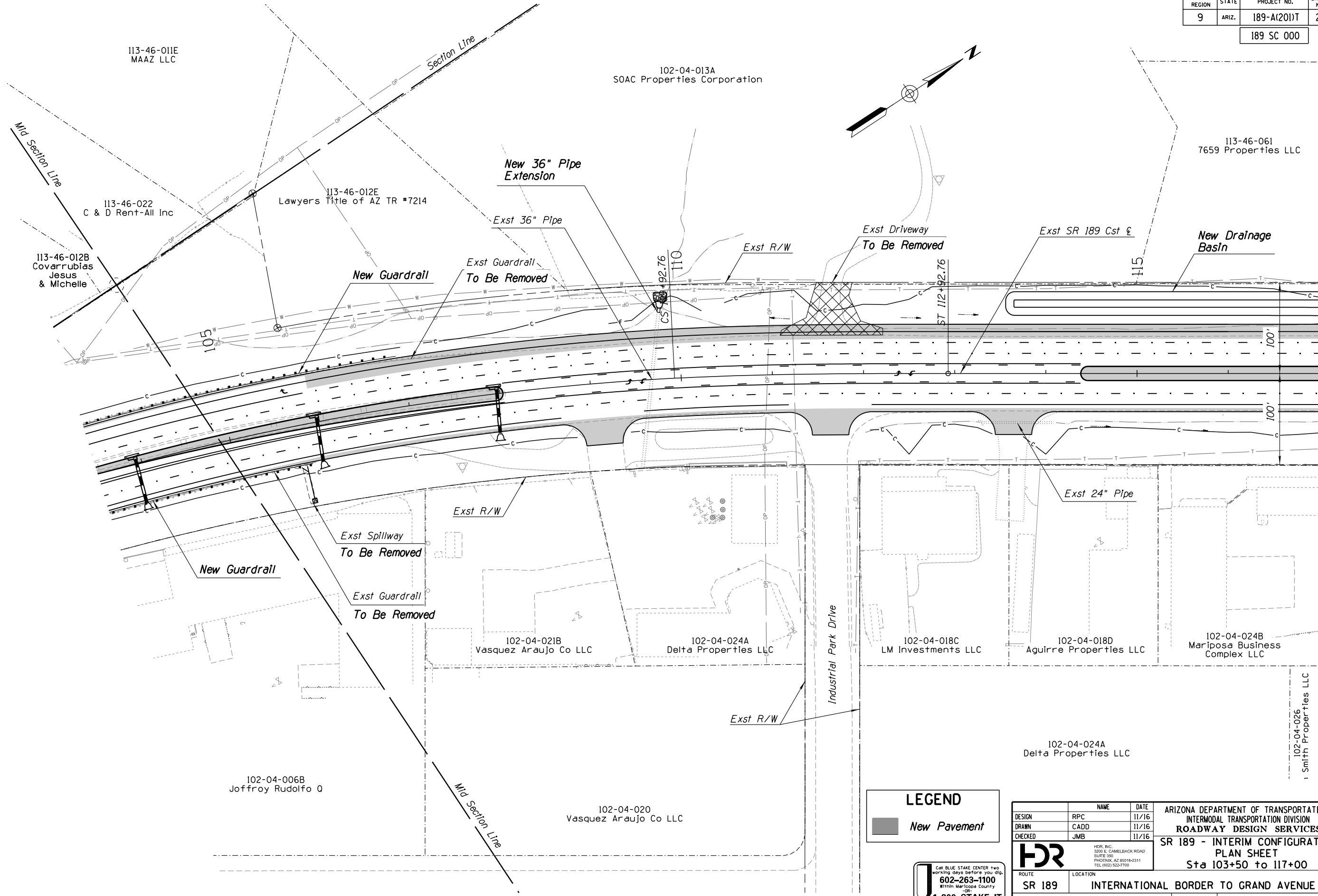
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**602-263-1100**  
Within Maricopa County  
OR  
**1-800-STAKE-IT**  
(182-5548)

		NAME	DATE	ARIZONA DEPARTMENT OF TRANSPORTATION INTERMODAL TRANSPORTATION DIVISION ROADWAY DESIGN SERVICES SR 189 - INTERIM CONFIGURATION PLAN SHEET Sta 89+50 to 103+50		PRELIMINARY <b>STAGE II</b> Review NOT FOR CONSTRUCTION OR RECORDING
DESIGN	RPC		11/16			
DRAWN	CADD		11/16			
CHECKED	JMB		11/16			
		HDR, INC. 3200 E. CAMELBACK ROAD SUITE 100 PHOENIX, AZ 85018-2311 TEL: (602) 522-7700		SR 189 - INTERIM CONFIGURATION PLAN SHEET Sta 89+50 to 103+50		CONSTRUCTION OR RECORDING
ROUTE		LOCATION				
SR 189		INTERNATIONAL BORDER TO GRAND AVENUE				DWG NO. C-01.05
TRACS NO. H8045 OIL					189-SC-000	___ OF ___

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REVISIONS: \_\_\_\_\_  
FINISHED PLANS: \_\_\_\_\_  
SURVEY NO.: \_\_\_\_\_

F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	RECORD DRAWING
9	ARIZ.	189-AI2011T	21	74	


189 SC 000



**LEGEND**

New Pavement

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**602-263-1100**  
Within Maricopa County  
OR  
**1-800-STAKE-IT**  
(182-5548)

		NAME	DATE	ARIZONA DEPARTMENT OF TRANSPORTATION INTERMODAL TRANSPORTATION DIVISION ROADWAY DESIGN SERVICES  SR 189 - INTERIM CONFIGURATION PLAN SHEET Sta 103+50 to 117+00	PRELIMINARY  <b>STAGE II</b>  Review NOT FOR CONSTRUCTION OR RECORDING
DESIGN	RPC		11/16		
DRAWN	CADD		11/16		
CHECKED	JMB		11/16		
		HDR, INC. 3200 E. CAMELBACK ROAD SUITE 200 PHOENIX, AZ 85018-2311 TEL (602) 522-7700			
ROUTE		LOCATION			
SR 189		INTERNATIONAL BORDER TO GRAND AVENUE		DWG NO. C-01.06	
TRACS NO. H8045 OIL			189-SC-000		___ OF ___

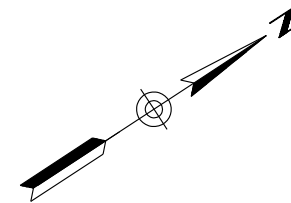
F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	RECORD DRAWING
9	ARIZ.	189-A(201)T	22	74	

189 SC 000

102-03-010E  
Delta Properties LLP

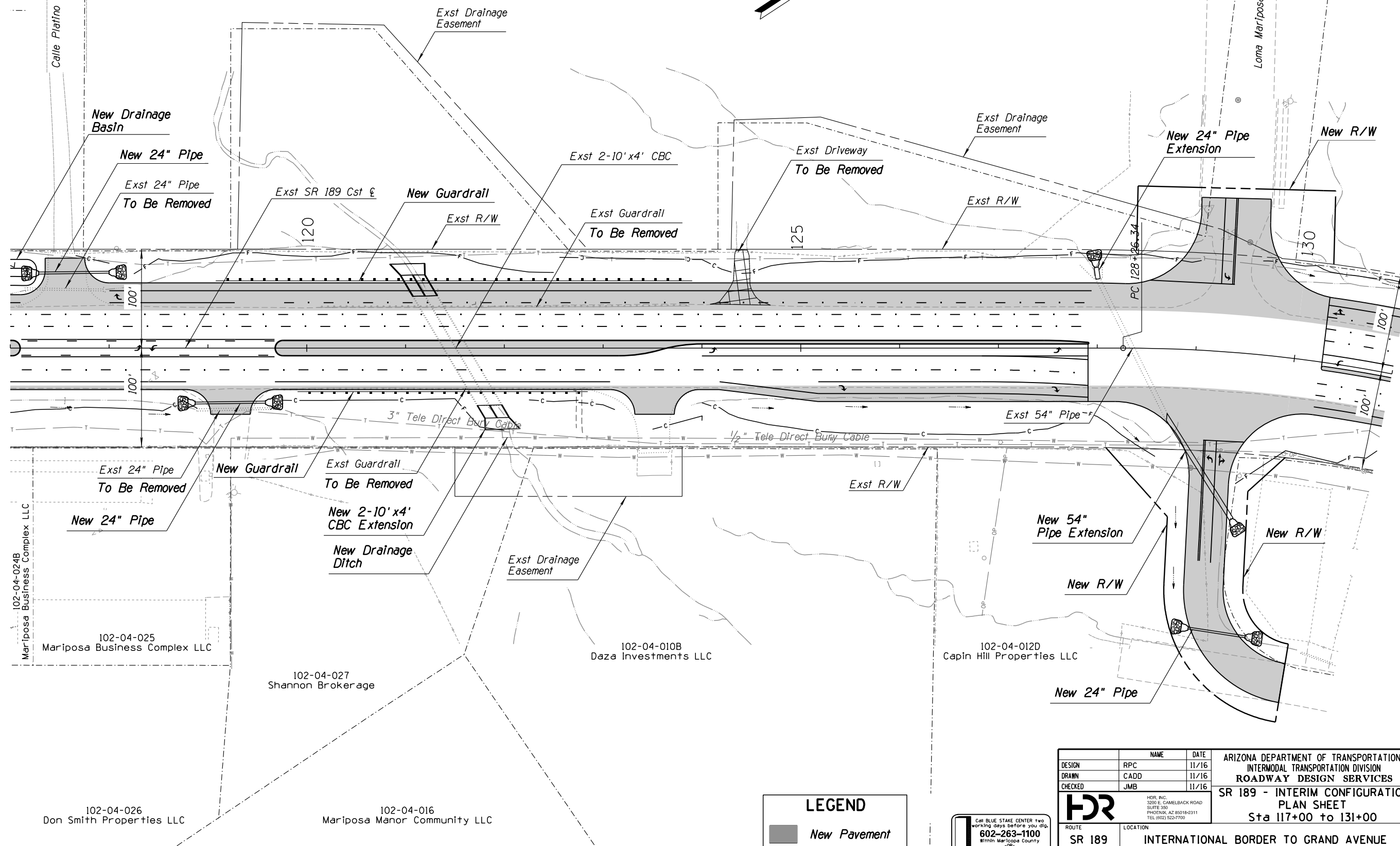
113-46-011C  
7569 Properties LLC

113-46-011C  
7569 Properties LLC



Loma Marina Rd


Calle Platino Rd



## LEGEND

*New Pavement*

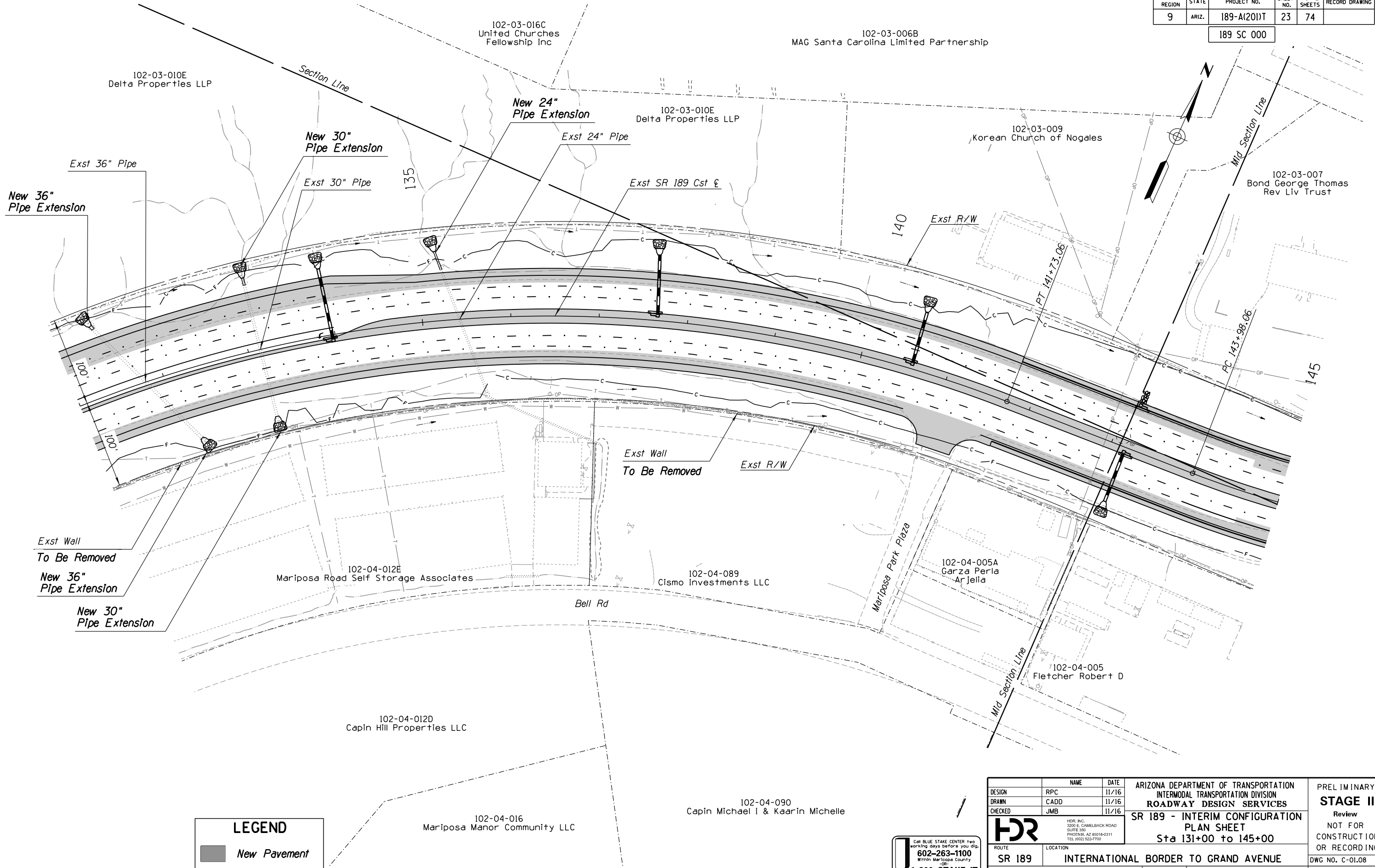
Call BLUE STAKE CENTER two working days before you need it.  
**602-263-1100**  
 Within Maricopa County  
 -OR-  
**1-800-STAKE-1**  
 (722-5348)

		NAME		DATE		ARIZONA DEPARTMENT OF TRANSPORTATION INTERMODAL TRANSPORTATION DIVISION ROADWAY DESIGN SERVICES		PRELIMINARY <b>STAGE II</b> Review NOT FOR CONSTRUCTION OR RECORDING	
DESIGN		RPC		11/16		SR 189 - INTERIM CONFIGURATION PLAN SHEET Sta 117+00 to 131+00		CONSTRUCTION OR RECORDING	
DRAWN		CADD		11/16					
CHECKED		JMB		11/16					
		HDR, INC. 5200 E GAMBELBL ROAD SUITE 300 PHOENIX, AZ 85018-2311 TEL (602) 522-7700				DWG NO. C-01.07 OF			
		ROUTE		LOCATION					
SR 189		INTERNATIONAL BORDER TO GRAND AVENUE							
TRACS NO. H8045 OIL						189-SC-000			


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REVISIONS: 1  
FINISHED PLANS: 1  
SURVEY NO. 1

F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	RECORD DRAWING
9	ARIZ.	189-A1201IT	23	74	

189 SC 000



LEGEND	
	New Pavement

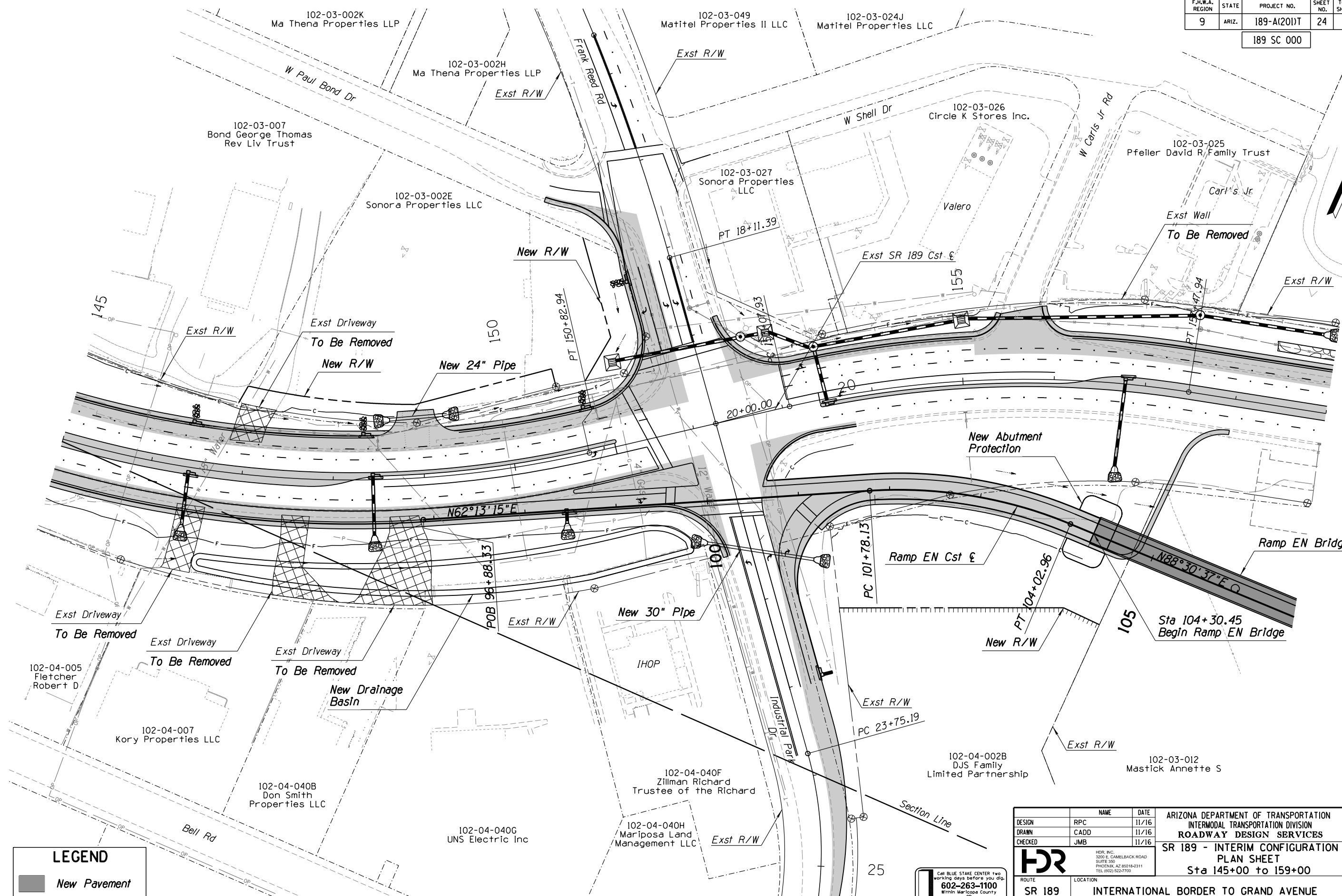
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DESIGN		RPC	11/16			
DRAWN		CADD	11/16			
CHECKED		JMB	11/16			
				HDR, INC. 3200 E. CAMELBACK ROAD SUITE 350 PHOENIX, AZ 85018-0311 TEL (602) 522-7700		
ROUTE		LOCATION		DWG NO. C-01.08		
SR 189		INTERNATIONAL BORDER TO GRAND AVENUE				
TRACS NO. H8045 OIL				189-SC-000		OF






F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	RECORD DRAWING
9	ARIZ.	189-A(201)T	24	74	

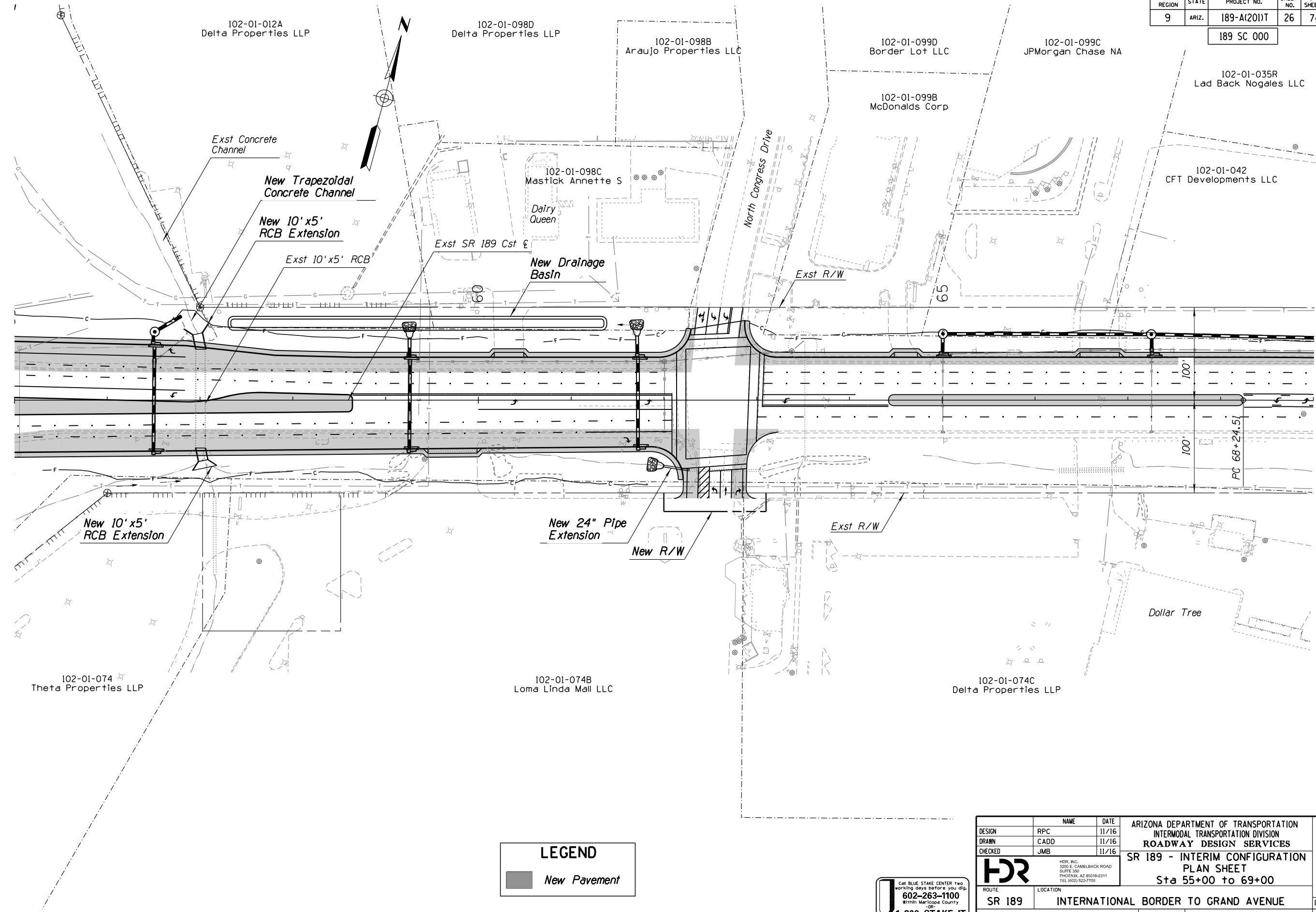
189 SC 000



		NAME	DATE	ARIZONA DEPARTMENT OF TRANSPORTATION INTERMODAL TRANSPORTATION DIVISION ROADWAY DESIGN SERVICES  SR 189 - INTERIM CONFIGURATION PLAN SHEET Sta 145+00 to 159+00	PRELIMINARY  STAGE II  Review  NOT FOR CONSTRUCTION OR RECORDING
DESIGN		RPC	11/16		
DRAWN		CADD	11/16		
CHECKED		JMB	11/16		
		HDR, INC. 3200 E. CAMELBACK ROAD SUITE 500 PHOENIX, AZ 85018-2311 TEL (602) 522-7700			
ROUTE	LOCATION		DWG NO. C-01.09		
SR 189	INTERNATIONAL BORDER TO GRAND AVENUE				
TRACS NO. H8045 OIL				189-SC-000	___ OF ___



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SURVEY NO.: \_\_\_\_\_  
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REVISIONS: \_\_\_\_\_  
FINISHED PLANS: \_\_\_\_\_  
SURVEY NO.: \_\_\_\_\_



F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	RECORD DRAWING
9	ARIZ.	189-AI2011T	26	74	

189 SC 000

LEGEND

New Pavement

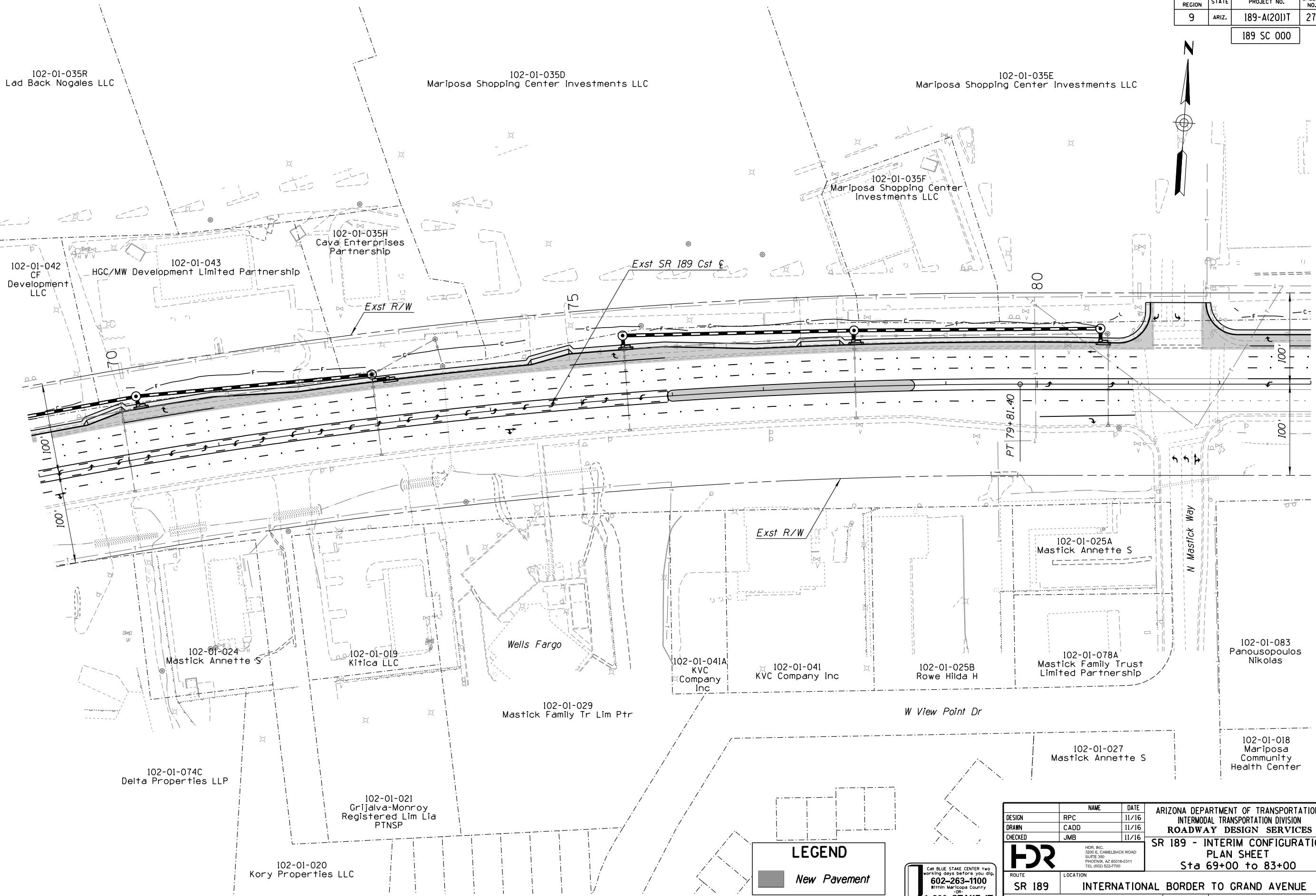
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602-263-1100  
Within Maricopa County  
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1782-55481

DESIGN	RPC	NAME	DATE	ARIZONA DEPARTMENT OF TRANSPORTATION INTERMODAL TRANSPORTATION DIVISION ROADWAY DESIGN SERVICES  SR 189 - INTERIM CONFIGURATION PLAN SHEET Sta 55+00 to 69+00	PRELIMINARY <b>STAGE II</b> Review NOT FOR CONSTRUCTION OR RECORDING
DRAWN	CADD				
CHECKED	JMB				
ROUTE		LOCATION		DWG NO. C-01.11	
SR 189		INTERNATIONAL BORDER TO GRAND AVENUE			
TRACS NO. H8045 OIL				189-SC-000	
				OF	

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REVISIONS: \_\_\_\_\_  
FINISHED PLANS: \_\_\_\_\_  
SURVEY NO.: \_\_\_\_\_

F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	RECORD DRAWING
9	ARIZ.	189-AI201IT	27	74	


189 SC 000



**LEGEND**

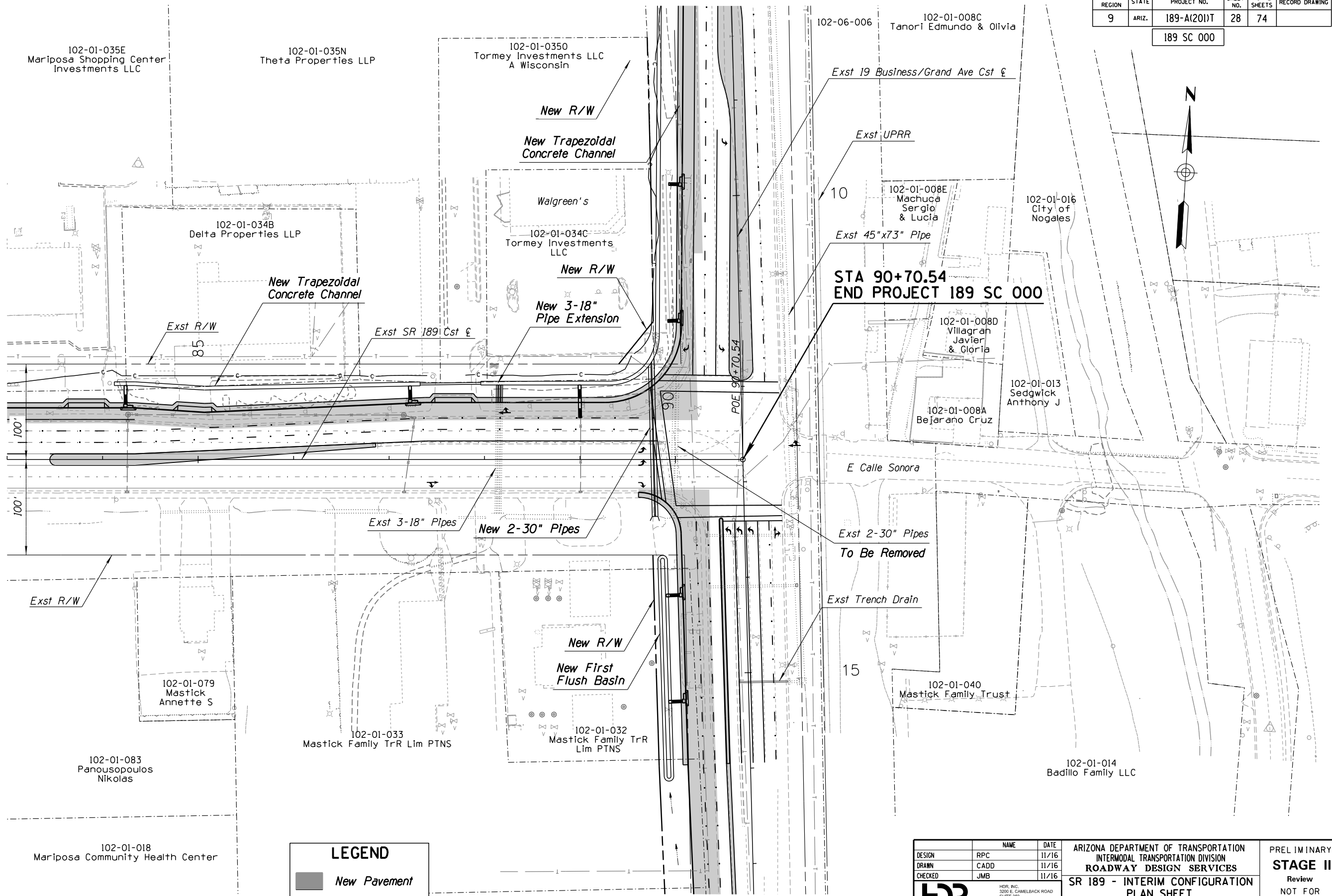
New Pavement

Call BLUE STAKE CENTER two working days before you dig.  
**602-263-1100**  
Within Maricopa County  
OR  
**1-800-STAKE-IT**  
(182-5548)

		NAME	DATE	ARIZONA DEPARTMENT OF TRANSPORTATION INTERMODAL TRANSPORTATION DIVISION ROADWAY DESIGN SERVICES  SR 189 - INTERIM CONFIGURATION PLAN SHEET Sta 69+00 to 83+00	PRELIMINARY <b>STAGE II</b>  Review NOT FOR CONSTRUCTION OR RECORDING
DESIGN	RPC		11/16		
DRAWN	CADD		11/16		
CHECKED	JMB		11/16		
		HDR, INC. 3200 E. CAMELBACK ROAD SUITE 100 PHOENIX, AZ 85018-2311 TEL: (602) 522-7700			
ROUTE		LOCATION			DWG NO. C-01.12
SR 189		INTERNATIONAL BORDER TO GRAND AVENUE			
TRACS NO. H8045 OIL			189-SC-000		___ OF ___




F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	RECORD DRAWING
9	ARIZ.	189-AI201IT	28	74	
189 SC 000					



**LEGEND**

 **New Pavement**

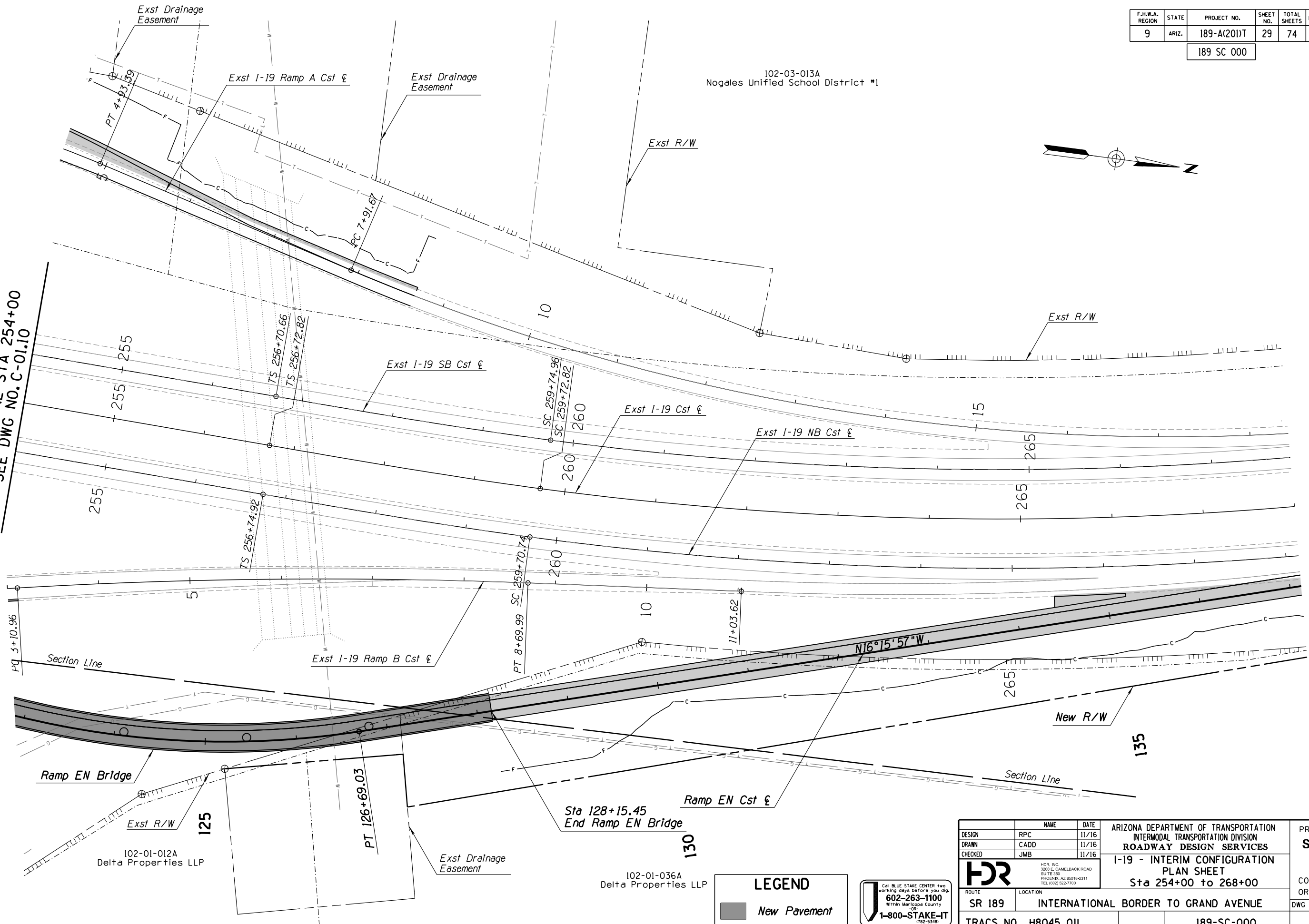
Call BLUE STAKE CENTER two working days before you dig.  
**602-263-1100**  
Within Maricopa County  
OR  
**1-800-STAKE-IT**  
(182-5548)

		NAME	DATE	ARIZONA DEPARTMENT OF TRANSPORTATION INTERMODAL TRANSPORTATION DIVISION ROADWAY DESIGN SERVICES SR 189 - INTERIM CONFIGURATION PLAN SHEET Sta 83+00 to 90+70.54		PRELIMINARY
DESIGN	RPC		11/16			STAGE II Review NOT FOR CONSTRUCTION OR RECORDING
DRAWN	CADD		11/16			
CHECKED	JMB		11/16			
		HDR, INC. 3200 E. CAMELBACK ROAD SUITE 350 PHOENIX, AZ 85018-2311 TEL. (602) 952-7700				
ROUTE		LOCATION				
SR 189		INTERNATIONAL BORDER TO GRAND AVENUE				DWG NO. C-01.13
TRACS NO. H8045 OIL					189-SC-000	___ OF ___

F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	RECORD DRAWING
9	ARIZ.	189-AI2011T	29	74	

189 SC 000

MATCH LINE STA 254+00  
SEE DWG NO. C-01.10



**LEGEND**

■ New Pavement

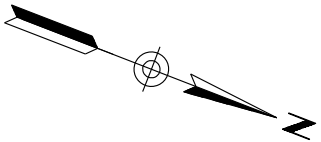
Call BLUE STAKE CENTER two working days before you dig.  
**602-263-1100**  
Within Maricopa County  
OR  
**1-800-STAKE-IT**  
(182-5348)

DESIGN	RPC	NAME		DATE	11/16
DRAWN	CADD				11/16
CHECKED	JMB				11/16
<b>ARIZONA DEPARTMENT OF TRANSPORTATION</b> <b>INTERMODAL TRANSPORTATION DIVISION</b> <b>ROADWAY DESIGN SERVICES</b>					
<b>I-19 - INTERIM CONFIGURATION</b> <b>PLAN SHEET</b> <b>Sta 254+00 to 268+00</b>					
ROUTE <b>SR 189</b>			LOCATION <b>INTERNATIONAL BORDER TO GRAND AVENUE</b>		
TRACS NO. H8045 OIL			189-SC-000		
PRELIMINARY <b>STAGE II</b> Review NOT FOR CONSTRUCTION OR RECORDING					DWG NO. C-01.14 <b>OF</b>

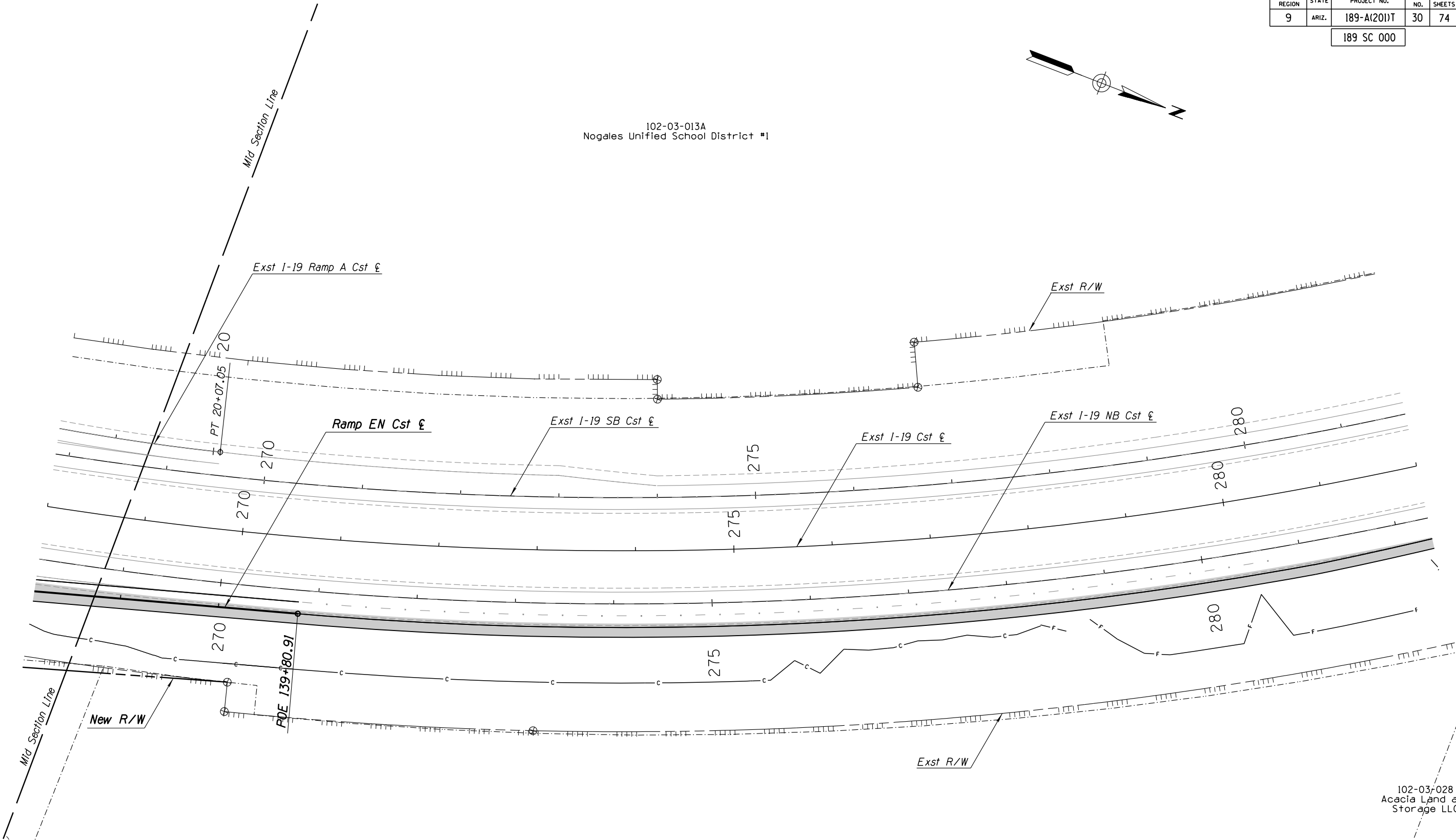
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PLOT BY: AHOFFMAN  
DATE: LOCATION: REVISIONS: FINISHED PLANS: SURVEY NO. DATE: LOCATION: REVISIONS: FINISHED PLANS: SURVEY NO. DATE: LOCATION: REVISIONS: FINISHED PLANS: SURVEY NO.

F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	RECORD DRAWING
9	ARIZ.	189-AI2011T	30	74	

189 SC 000



102-03-013A  
Nogales Unified School District #1




102-03-028  
Acacia Land and  
Storage LLC

102-01-300  
Santa Cruz County Complex

LEGEND

New Pavement

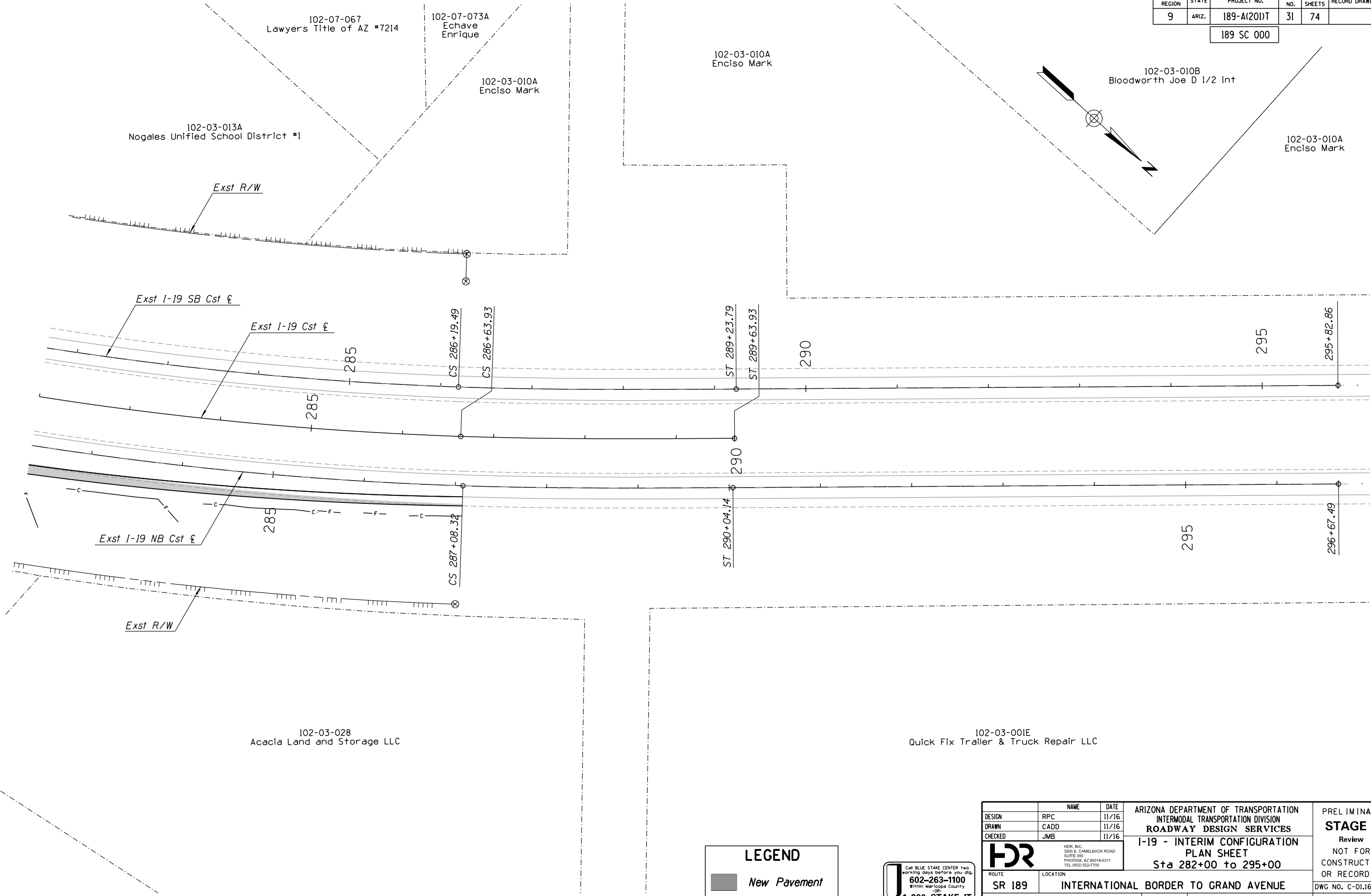
Call BLUE STAKE CENTER two working days before you dig.  
602-263-1100  
Within Maricopa County  
OR  
1-800-STAKE-IT  
1782-55481

		NAME		DATE		ARIZONA DEPARTMENT OF TRANSPORTATION INTERMODAL TRANSPORTATION DIVISION ROADWAY DESIGN SERVICES	PRELIMINARY <b>STAGE II</b> Review NOT FOR CONSTRUCTION OR RECORDING
DESIGN	RPC		11/16				
DRAWN	CADD		11/16				
CHECKED	JMB		11/16				
		HDR, INC. 3200 E. CABELLBACK ROAD SUITE 300 PHOENIX, AZ 85018-2311 TEL (602) 922-7700				I-19 - INTERIM CONFIGURATION PLAN SHEET Sta 268+00 to 282+00	DWG NO. C-01.15
ROUTE		LOCATION				INTERNATIONAL BORDER TO GRAND AVENUE	OF
SR 189							
TRACS NO. H8045 OIL				189-SC-000			

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LOCATION: \_\_\_\_\_  
REVISIONS: \_\_\_\_\_  
FINISHED PLANS: \_\_\_\_\_  
SURVEY NO.: \_\_\_\_\_  
DATE: \_\_\_\_\_  
LOCATION: \_\_\_\_\_  
REVISIONS: \_\_\_\_\_  
FINISHED PLANS: \_\_\_\_\_  
SURVEY NO.: \_\_\_\_\_

F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	RECORD DRAWING
9	ARIZ.	189-A(20)IT	31	74	


189 SC 000



LEGEND

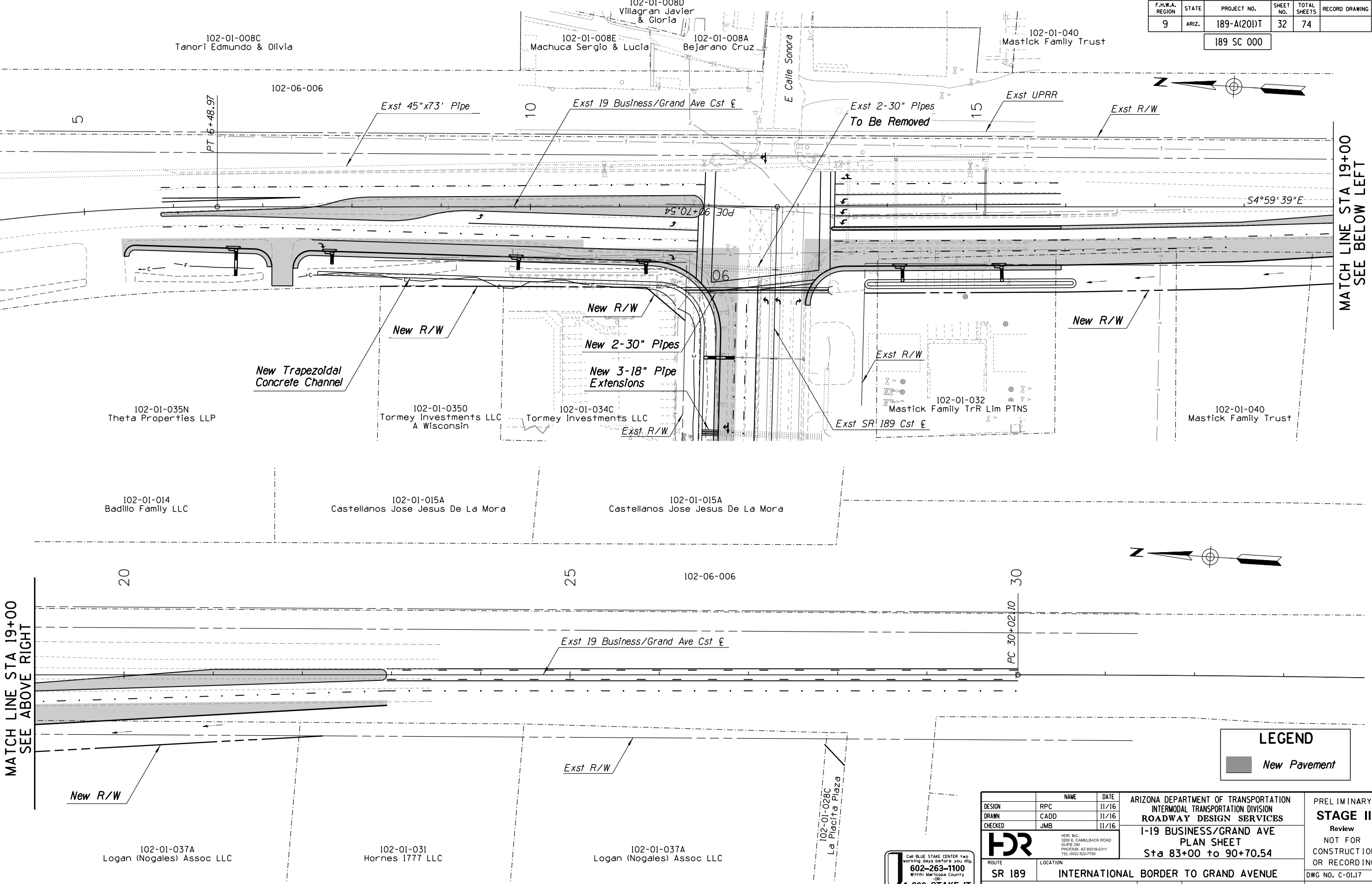
New Pavement




		NAME	DATE	ARIZONA DEPARTMENT OF TRANSPORTATION INTERMODAL TRANSPORTATION DIVISION ROADWAY DESIGN SERVICES  I-19 - INTERIM CONFIGURATION PLAN SHEET Sta 282+00 to 295+00		PRELIMINARY <b>STAGE II</b> Review NOT FOR CONSTRUCTION OR RECORDING
DESIGN		RPC	11/16			
DRAWN		CADD	11/16			
CHECKED		JMB	11/16			
		HDR, INC. 3200 E. CAMELBACK ROAD SUITE 350 PHOENIX, AZ 85018-2311 TEL: (602) 522-7700				DWG NO. C-01.16
ROUTE		LOCATION				
SR 189		INTERNATIONAL BORDER TO GRAND AVENUE				
TRACS NO. H8045 OIL			189-SC-000			___ OF ___

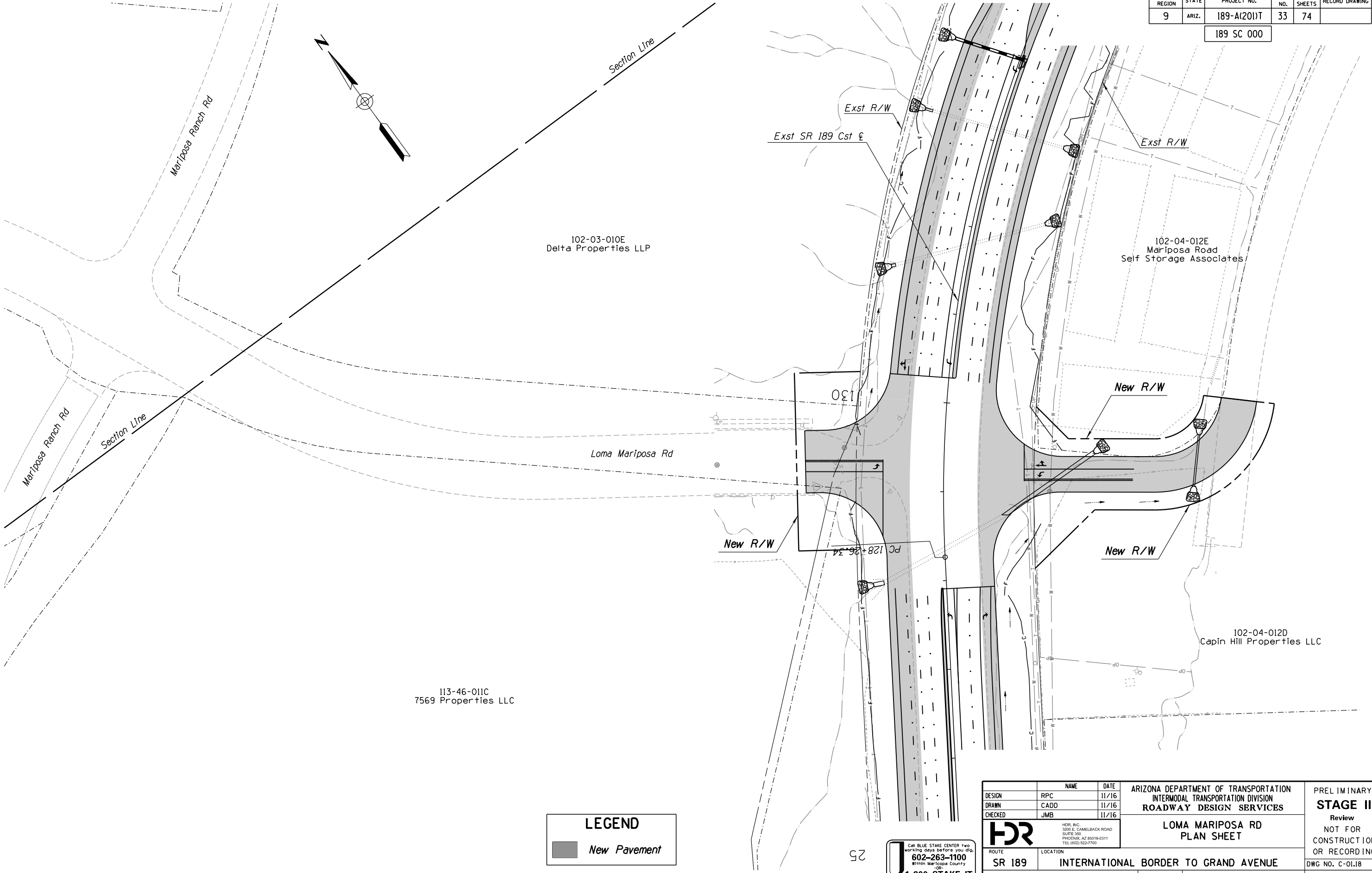


F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	RECORD DRAWING
9	ARIZ.	189-AI201IT	32	74	
189 SC 000					



Call BLUE STAKE CENTER two working days before you dig.  
**602-263-1100**  
Within Maricopa County  
OR  
**1-800-STAKE-IT**  
(182-5548)

		NAME	DATE	ARIZONA DEPARTMENT OF TRANSPORTATION INTERMODAL TRANSPORTATION DIVISION ROADWAY DESIGN SERVICES	PRELIMINARY <b>STAGE II</b> Review NOT FOR CONSTRUCTION OR RECORDING
DESIGN		RPC	11/16		
DRAWN		CADD	11/16		
CHECKED		JMB	11/16		
		HDR, INC. 3200 E. CAMELBACK ROAD SUITE 350 PHOENIX, AZ 85018-2311 TEL. (602) 962-7700		I-19 BUSINESS/GRAND AVE PLAN SHEET Sta 83+00 to 90+70.54	DWG NO. C-01.17
ROUTE		LOCATION			
SR 189		INTERNATIONAL BORDER TO GRAND AVENUE			
TRACS NO. H8045 OIL				189-SC-000	___ OF ___



F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	RECORD DRAWING
9	ARIZ.	189-AI201IT	33	74	

189 SC 000


LEGEND

New Pavement

Call BLUE STAKE CENTER two working days before you dig.

602-263-1100

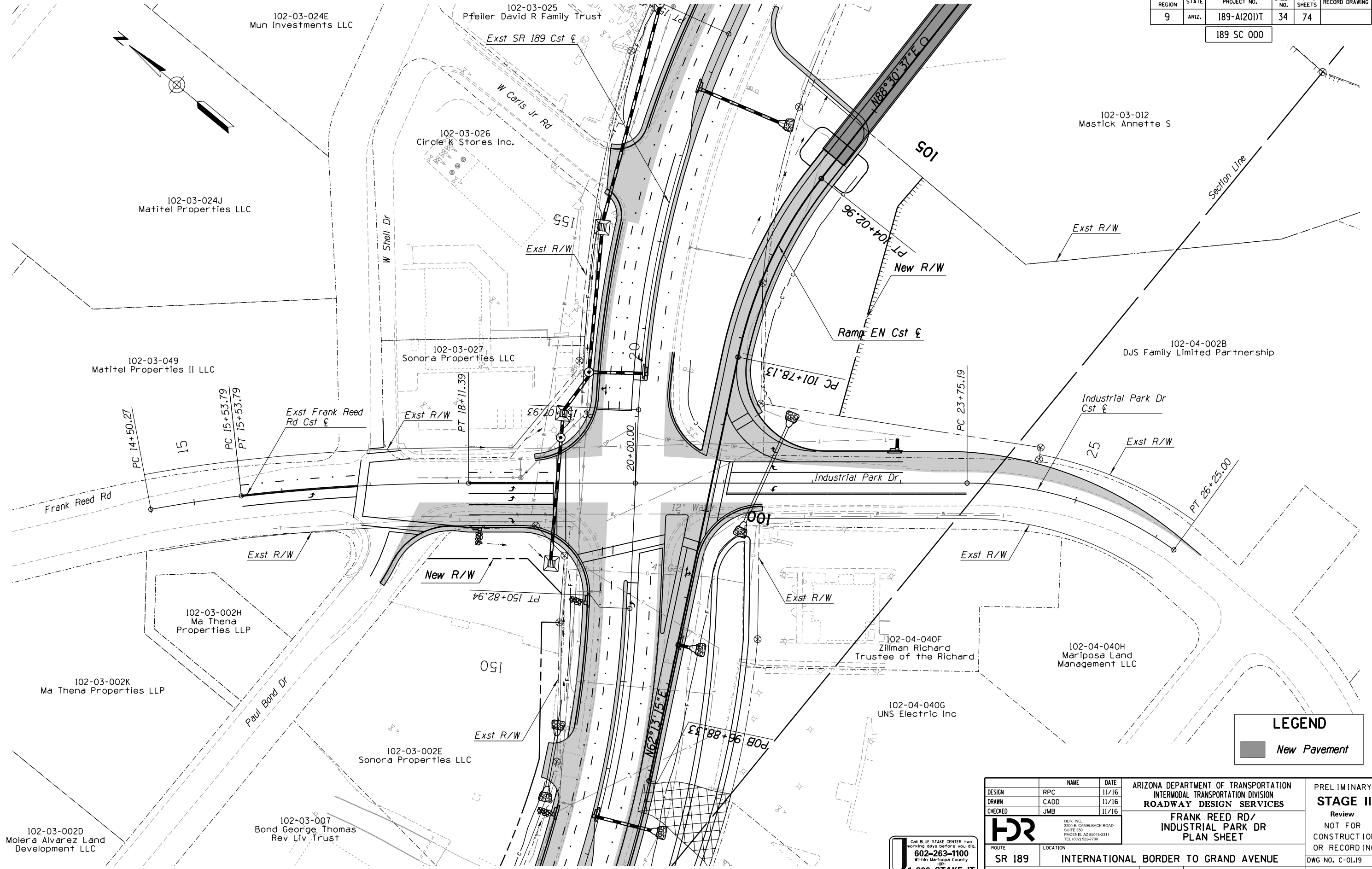
1-800-STAKE-IT

		NAME	DATE	ARIZONA DEPARTMENT OF TRANSPORTATION INTERMODAL TRANSPORTATION DIVISION ROADWAY DESIGN SERVICES	PRELIMINARY <b>STAGE II</b> Review NOT FOR CONSTRUCTION OR RECORDING
DESIGN		RPC	11/16		
DRAWN		CADD	11/16		
CHECKED		JMB	11/16		
		HDR, INC. 3001 S. CAMELBACK ROAD SUITE 350 PHOENIX, AZ 85018-2311 TEL: (602) 522-7700		LOMA MARIPOSA RD PLAN SHEET	
ROUTE		LOCATION		DWG NO. C-01.18	
SR 189		INTERNATIONAL BORDER TO GRAND AVENUE			
TRACS NO. H8045 OIL				189-SC-000	___ OF ___


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TIME: 10:19:00 AM  
PLOT SCALE: 1:100  
PLOT BY: AHOFMAN  
DATE: \_\_\_\_\_  
LOCATION: \_\_\_\_\_  
REVISIONS: \_\_\_\_\_  
FINISHED PLANS: \_\_\_\_\_  
SURVEY NO. \_\_\_\_\_  
DATE: \_\_\_\_\_  
LOCATION: \_\_\_\_\_  
REVISIONS: \_\_\_\_\_  
FINISHED PLANS: \_\_\_\_\_  
SURVEY NO. \_\_\_\_\_

F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	RECORD DRAWING
9	ARIZ.	189-AI201IT	34	74	

189 SC 000



LEGEND	
	New Pavement

		NAME	DATE	ARIZONA DEPARTMENT OF TRANSPORTATION INTERMODAL TRANSPORTATION DIVISION ROADWAY DESIGN SERVICES		PRELIMINARY <b>STAGE II</b> Review NOT FOR CONSTRUCTION OR RECORDING DWG NO. C-01.19
DESIGN		RPC	11/16			
DRAWN		CADD	11/16			
CHECKED		JMB	11/16			
		HDR, INC. 3200 E. CAMELBACK ROAD SUITE 100 PHOENIX, AZ 85018-2311 TEL: (602) 522-7700		FRANK REED RD/ INDUSTRIAL PARK DR PLAN SHEET		
ROUTE		LOCATION				
SR 189		INTERNATIONAL BORDER TO GRAND AVENUE				
TRACS NO. H8045 OIL				189-SC-000		

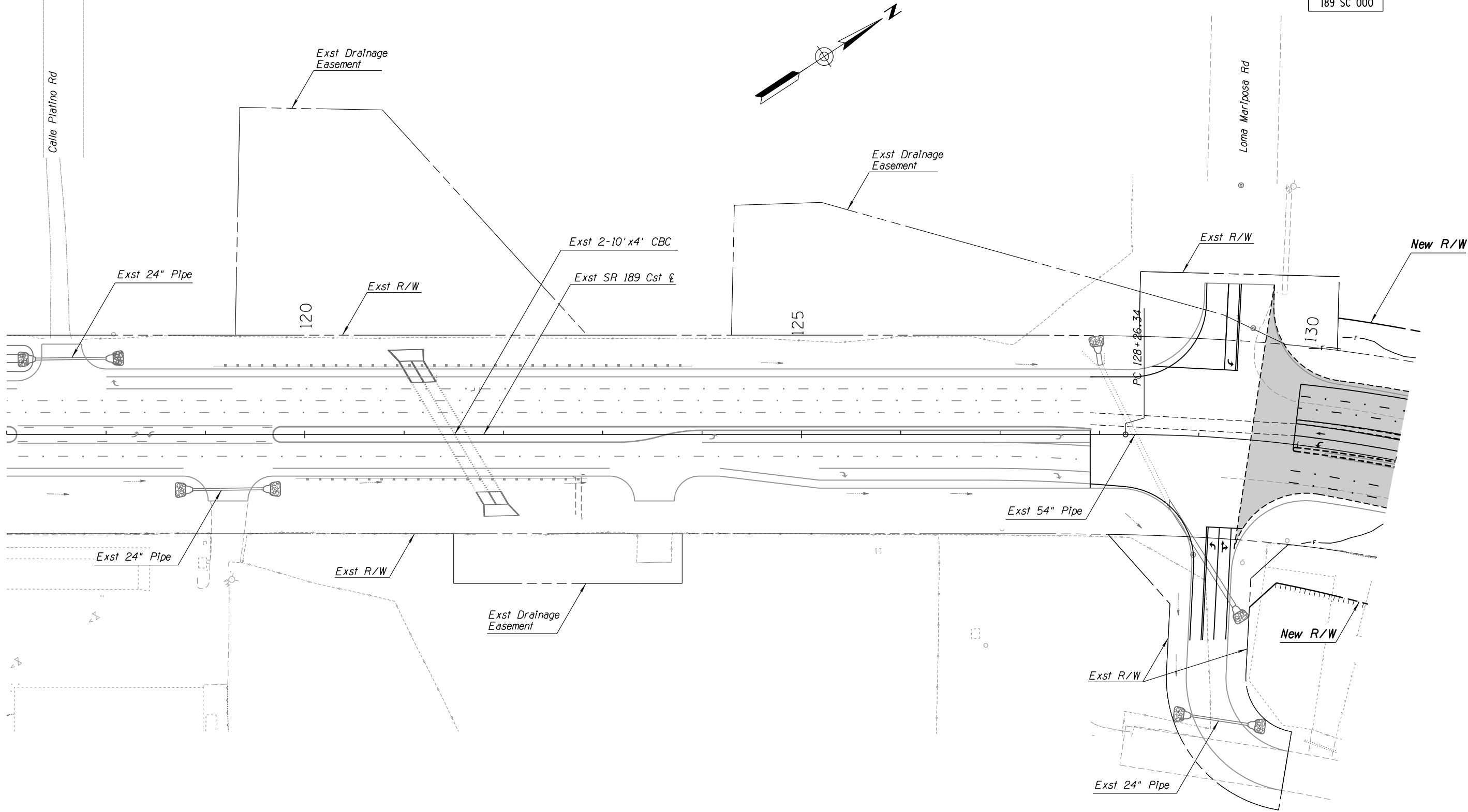
Call BLUE STAKE CENTER two  
working days before you dig.  
**602-263-1100**  
Within Maricopa County  
OR  
**1-800-STAKE-IT**  
(182-5348)

FILE NAME: c:\pwworking\phx\0476786\h8045.ph.pln07.dgn PLOT DATE: Nov, 16, 2016 TIME: 11:43 AM PLOT SCALE: 1/100 PLOT BY: AHOFFMAN

SURVEY NO. FINISHED PLANS. REVISIONS. LOCATION. DATE.

F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	RECORD DRAWING
9	ARIZ.	189-A(20)IT	35	74	


189 SC 000



LEGEND

New Pavement

Call BLUE STAKE CENTER two working days before you dig.  
602-263-1100  
Within Maricopa County  
OR  
1-800-STAKE-IT  
(182-5546)

		NAME	DATE	ARIZONA DEPARTMENT OF TRANSPORTATION INTERMODAL TRANSPORTATION DIVISION ROADWAY DESIGN SERVICES SR 189 - ULTIMATE CONFIGURATION PLAN SHEET Sta 117+00 to 131+00	PRELIMINARY <b>STAGE II</b> Review NOT FOR CONSTRUCTION OR RECORDING
DESIGN		RPC	11/16		
DRAWN		CADD	11/16		
CHECKED		JMB	11/16		
		HDR, INC. 3200 E. CAMELBACK ROAD SUITE 320 PHOENIX, AZ 85018-2311 TEL. (602) 922-7700			
ROUTE		LOCATION		DWG NO. C-01.20	
SR 189		INTERNATIONAL BORDER TO GRAND AVENUE			
TRACS NO. H8045 OIL			189-SC-000		
				___ OF ___	

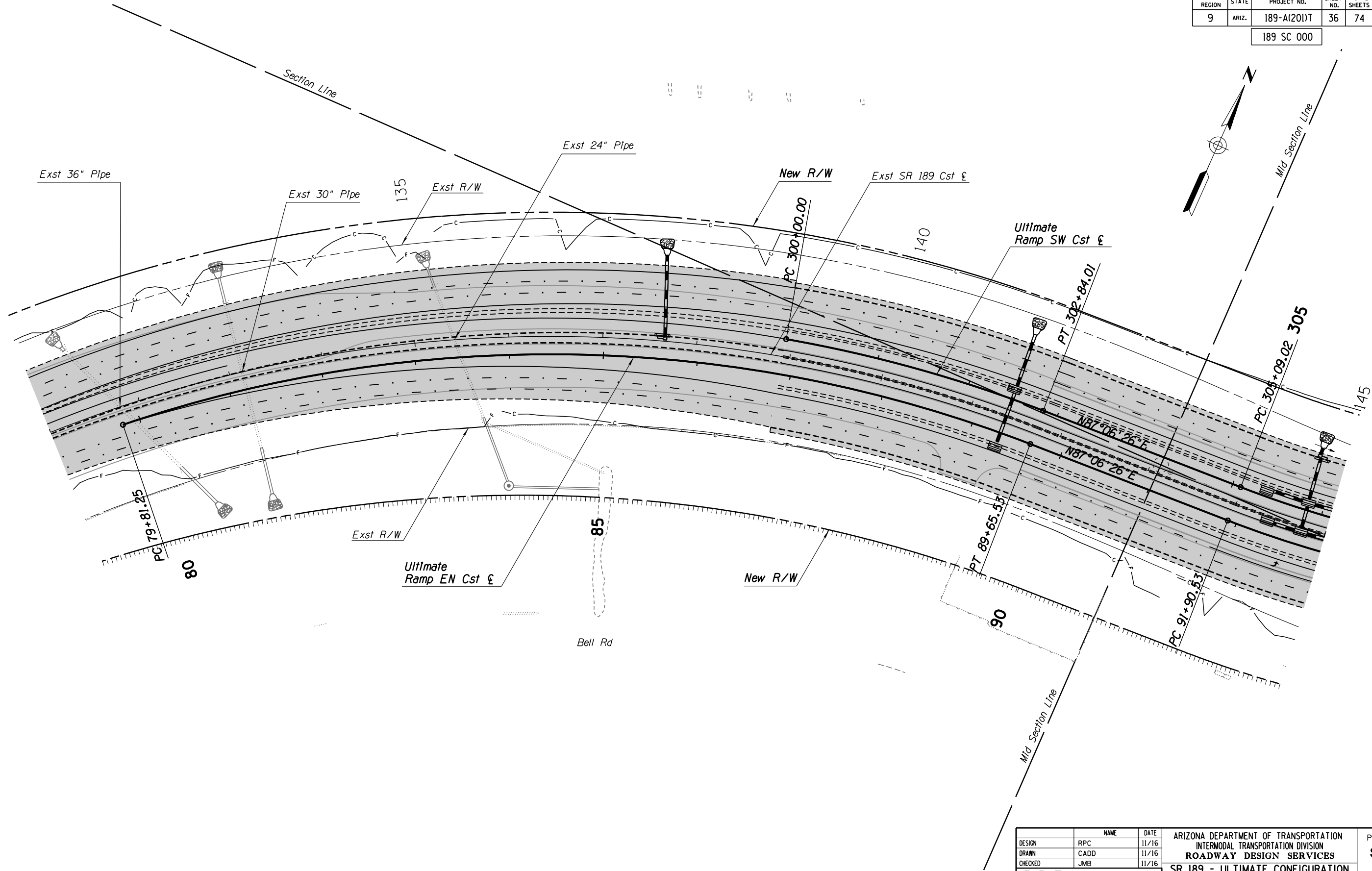


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SURVEY NO.	FINISHED PLANS	DATE	LOCATION	REVISIONS	DATE

F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	RECORD DRAWING
9	ARIZ.	189-A(20)IT	36	74	


189 SC 000



**LEGEND**

New Pavement

Call BLUE STAKE CENTER two working days before you dig.  
**602-263-1100**  
Within Maricopa County  
OR  
**1-800-STAKE-IT**  
(182-5548)

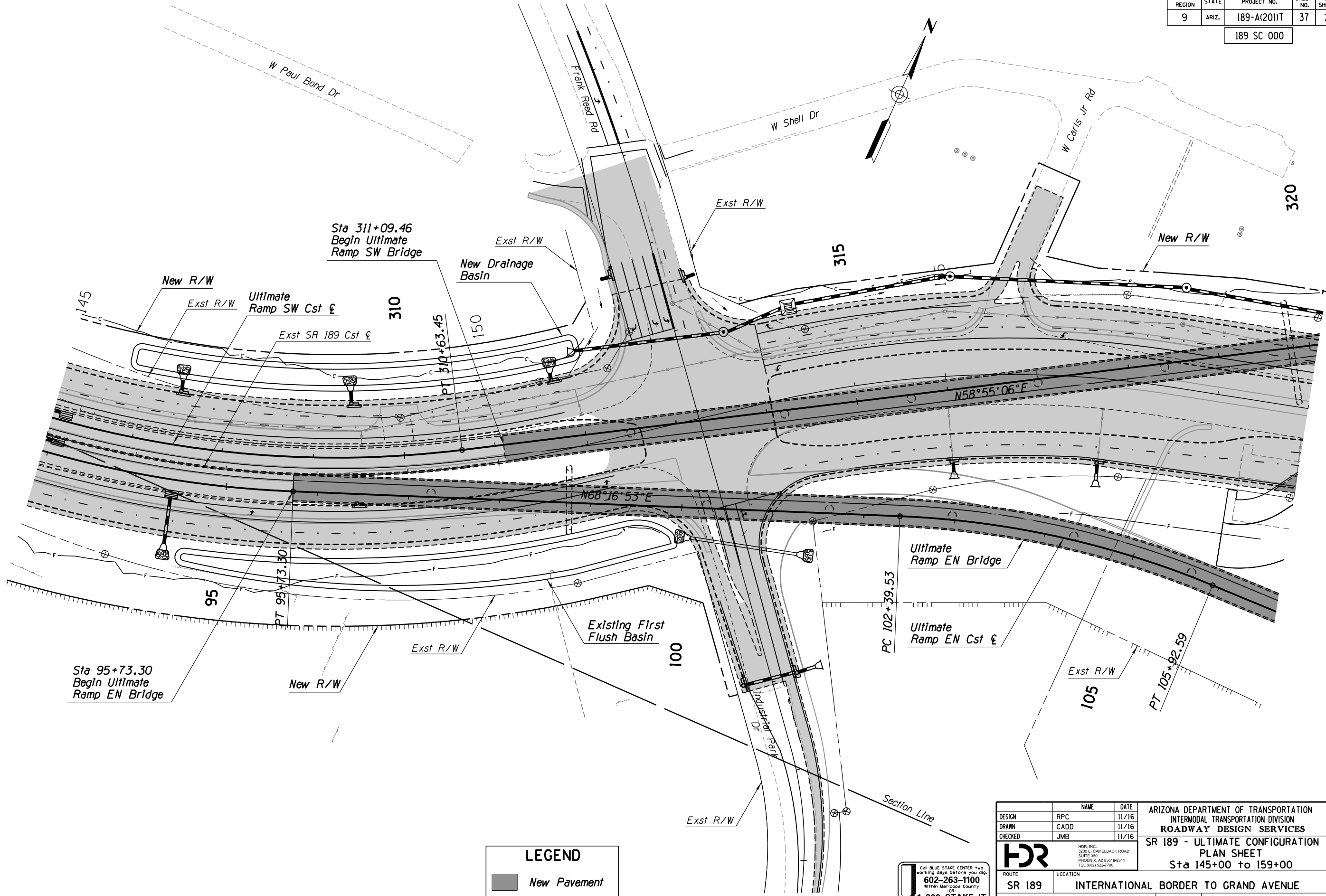
		NAME	DATE	ARIZONA DEPARTMENT OF TRANSPORTATION INTERMODAL TRANSPORTATION DIVISION ROADWAY DESIGN SERVICES  SR 189 - ULTIMATE CONFIGURATION PLAN SHEET Sta 131+00 to 145+00	PRELIMINARY <b>STAGE II</b>  Review NOT FOR CONSTRUCTION OR RECORDING
DESIGN	RPC		11/16		
DRAWN	CADD		11/16		
CHECKED	JMB		11/16		
		HDR, INC. 3200 E. CAMELBACK ROAD SUITE 300 PHOENIX, AZ 85018-2311 TEL (602) 525-2700			
ROUTE		LOCATION			
SR 189		INTERNATIONAL BORDER TO GRAND AVENUE			DWG NO. C-01.21
TRACS NO. H8045 OIL			189-SC-000		___ OF ___

FILE NAME: c:\pwworking\phx\0476786\h8045.phx.pln09.dgn PLOT DATE: Nov, 16, 2016 TIME: 12:19:37 PM PLOT SCALE: 1:100 PLOT BY: AHOFFMAN

SURVEY NO. FINISHED PLANS. REVISIONS. LOCATION. DATE.

F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	RECORD DRAWING
9	ARIZ.	189-A(20)IT	37	74	

189 SC 000



**LEGEND**

■ New Pavement

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**602-263-1100**  
Within Maricopa County  
OR  
**1-800-STAKE-IT**  
(182-5548)

DESIGN	RPC	DATE	11/16
DRAWN	CADD	DATE	11/16
CHECKED	JMB	DATE	11/16

**HDR** HDR, INC.  
3200 E. CAMELBACK ROAD  
SUITE 100  
PHOENIX, AZ 85018-2311  
TEL: (602) 522-7700

ROUTE: SR 189 LOCATION: INTERNATIONAL BORDER TO GRAND AVENUE

ARIZONA DEPARTMENT OF TRANSPORTATION  
INTERMODAL TRANSPORTATION DIVISION  
**ROADWAY DESIGN SERVICES**

**SR 189 - ULTIMATE CONFIGURATION  
PLAN SHEET  
Sta 145+00 to 159+00**

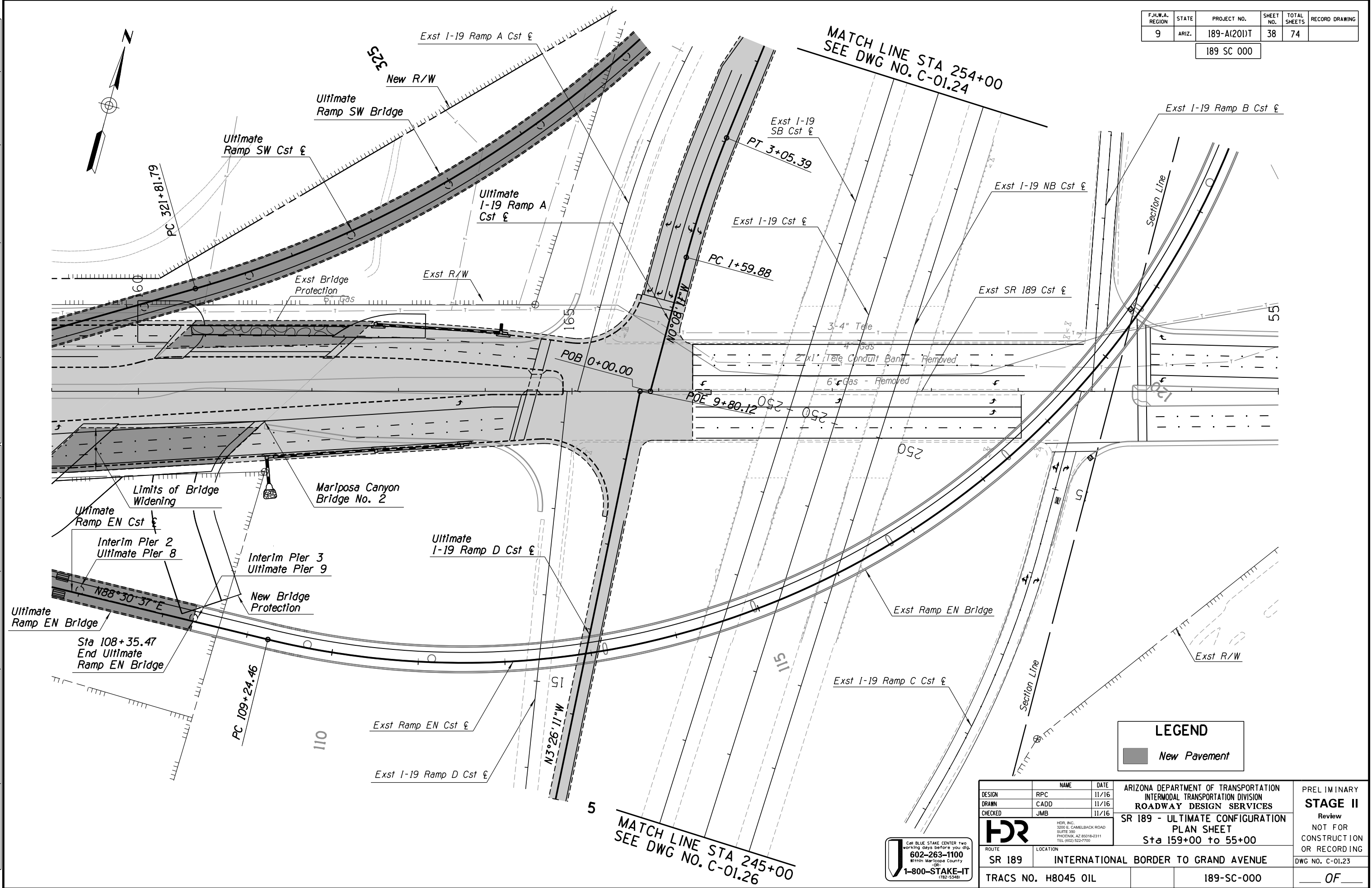
PRELIMINARY  
**STAGE II**  
Review  
NOT FOR  
CONSTRUCTION  
OR RECORDING

TRACS NO. H8045 OIL 189-SC-000 DWG NO. C-01.22 OF

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SURVEY NO. FINISHED PLANS REVISIONS LOCATION DATE


F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	RECORD DRAWING
9	ARIZ.	189-AI2011T	38	74	
189 SC 000					



**LEGEND**

New Pavement

Call BLUE STAKE CENTER two working days before you dig.  
**602-263-1100**  
Within Maricopa County  
OR  
**1-800-STAKE-IT**  
(182-5548)

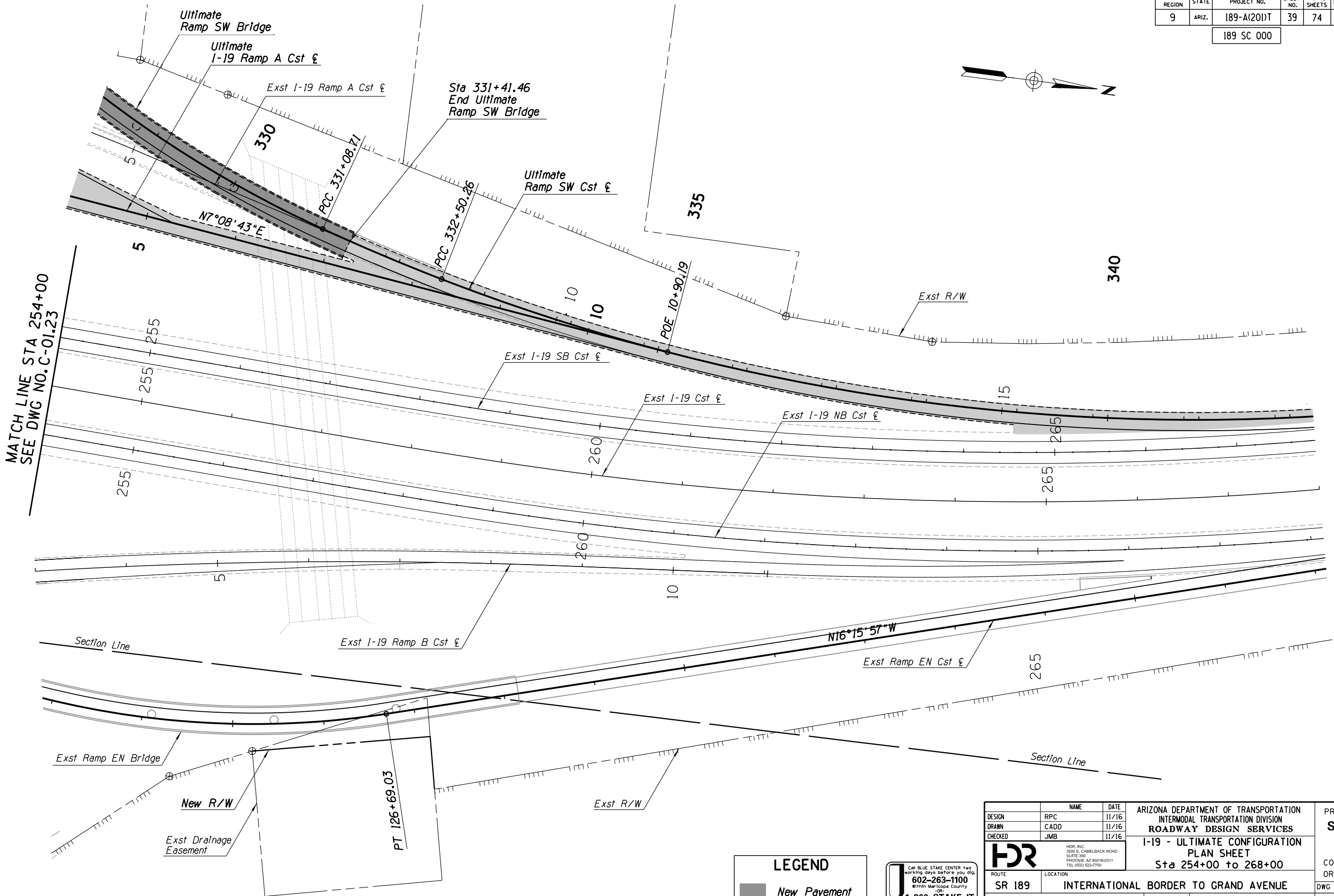
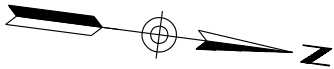
		NAME	DATE	ARIZONA DEPARTMENT OF TRANSPORTATION INTERMODAL TRANSPORTATION DIVISION ROADWAY DESIGN SERVICES SR 189 - ULTIMATE CONFIGURATION PLAN SHEET Sta 159+00 to 55+00	PRELIMINARY <b>STAGE II</b> Review NOT FOR CONSTRUCTION OR RECORDING DWG NO. C-01.23
DESIGN		RPC	11/16		
DRAWN		CADD	11/16		
CHECKED		JMB	11/16		
		HDR, INC. 3200 E. CAMELBACK ROAD SUITE 320 PHOENIX, AZ 85018-2311 TEL: (602) 962-7700			
ROUTE		LOCATION			
SR 189		INTERNATIONAL BORDER TO GRAND AVENUE			
TRACS NO. H8045 OIL			189-SC-000		___ <i>OF</i> ___

**HDR**  
HDR, INC.  
3200 E. CAMELBACK ROAD  
SUITE 100  
PHOENIX, AZ 85016-2311  
TEL: (602) 522-7700

FILE NAME: \\pwworking\phx\0476786\h8045.ph.pln14.dgn PLOT DATE: Nov, 16, 2016 TIME: 11:09:17 AM PLOT SCALE: 1:100 PLOT BY: AHOFFMAN  
SURVEY NO. FINISHED PLANS REVISIONS LOCATION DATE

F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	RECORD DRAWING
9	ARIZ.	189-A(20)IT	39	74	

189 SC 000



LEGEND

New Pavement

Call BLUE STAKE CENTER two working days before you dig.


602-263-1100

Within Maricopa County

OR

1-800-STAKE-IT

(782-5548)

		NAME	DATE	ARIZONA DEPARTMENT OF TRANSPORTATION INTERMODAL TRANSPORTATION DIVISION ROADWAY DESIGN SERVICES  I-19 - ULTIMATE CONFIGURATION PLAN SHEET Sta 254+00 to 268+00		PRELIMINARY <b>STAGE II</b>  Review NOT FOR CONSTRUCTION OR RECORDING
DESIGN	RPC		11/16			
DRAWN	CADD		11/16			
CHECKED	JMB		11/16			
				HDR, INC. 3200 E. CAMELBACK ROAD SUITE 300 PHOENIX, AZ 85018-2311 TEL (602) 922-7199		
ROUTE		LOCATION				
SR 189		INTERNATIONAL BORDER TO GRAND AVENUE				DWG NO. C-01.24
TRACS NO. H8045 OIL				189-SC-000		___ OF ___

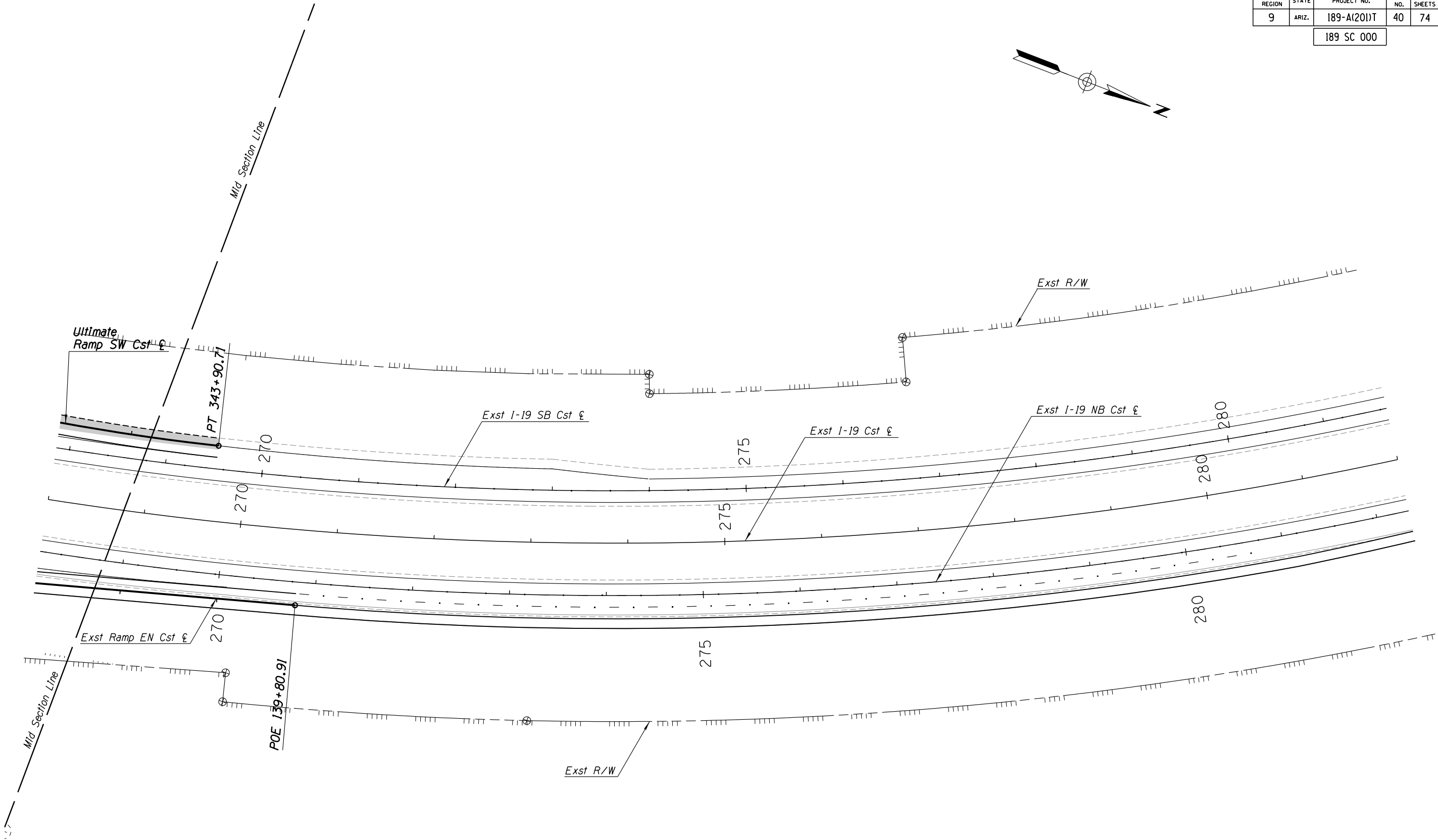
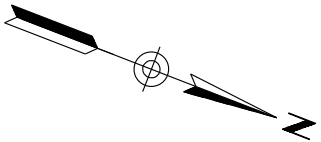


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SURVEY NO. FINISHED PLANS- REVISIONS- LOCATION- DATE- FINISHED PLANS- REVISIONS- LOCATION- DATE-

F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	RECORD DRAWING
9	ARIZ.	189-A12011T	40	74	


189 SC 000



LEGEND

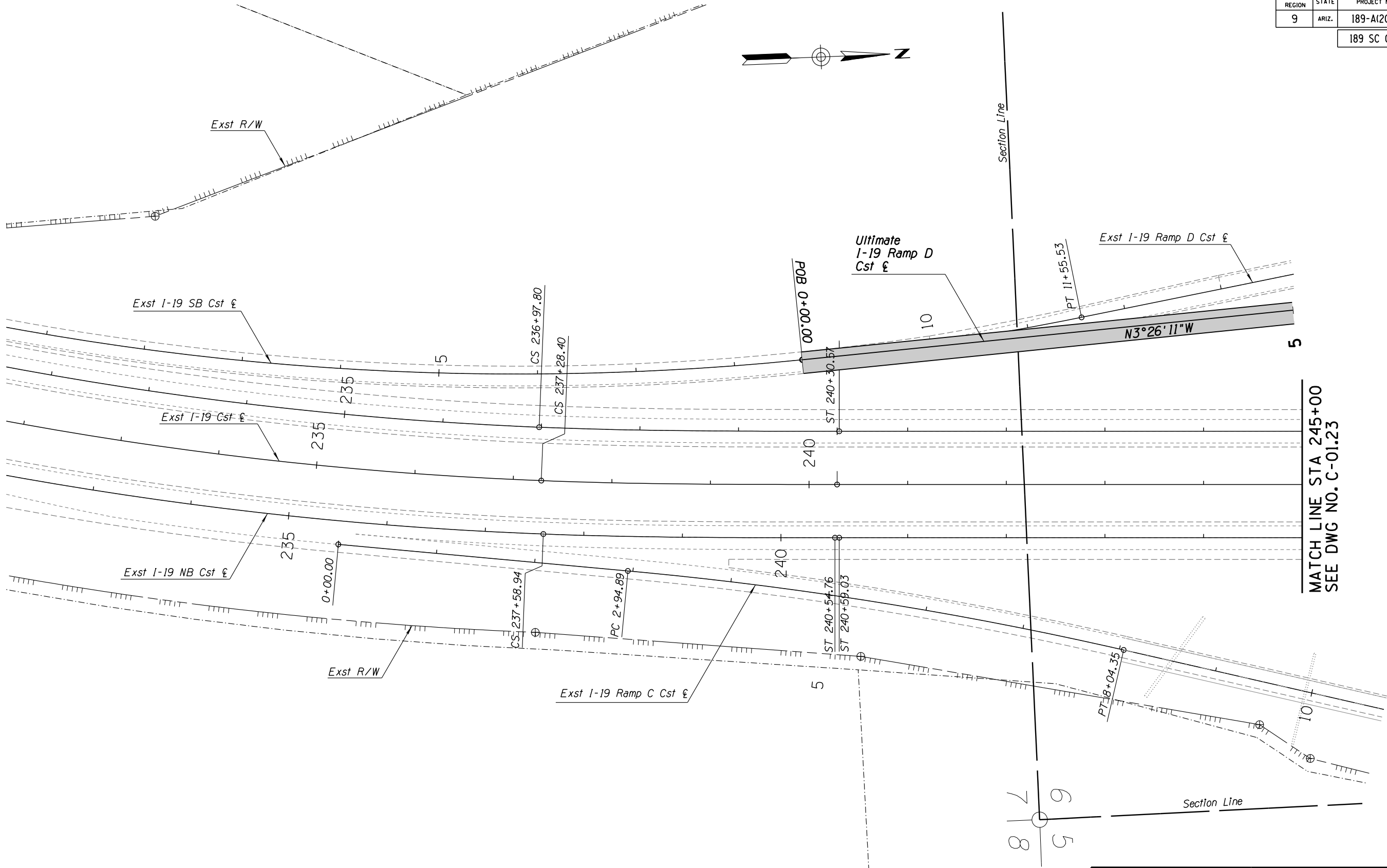
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602-263-1100  
Within Maricopa County  
OR  
1-800-STAKE-IT  
(182-5348)

		NAME		DATE		ARIZONA DEPARTMENT OF TRANSPORTATION INTERMODAL TRANSPORTATION DIVISION ROADWAY DESIGN SERVICES  I-19 - ULTIMATE CONFIGURATION PLAN SHEET Sta 268+00 to 282+00	PRELIMINARY <b>STAGE II</b>  Review NOT FOR CONSTRUCTION OR RECORDING
DESIGN	RPC		11/16				
DRAWN	CADD		11/16				
CHECKED	JMB		11/16				
		HDR, INC. 3200 E. CAMELBACK ROAD SUITE 100 PHOENIX, AZ 85018-0311 TEL (602) 522-7199					
ROUTE		LOCATION					
SR 189		INTERNATIONAL BORDER TO GRAND AVENUE				DWG NO. C-01.25	
TRACS NO. H8045 OIL				189-SC-000		___ OF ___	

F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	RECORD DRAWING
9	ARIZ.	189-A(20)IT	41	74	

189 SC 000



MATCH LINE STA 245+00  
SEE DWG NO. C-01.23

LEGEND

New Pavement


Call BLUE STAKE CENTER two working days before you dig.

602-263-1100

Within Maricopa County

1-800-STAKE-IT

(782-5548)

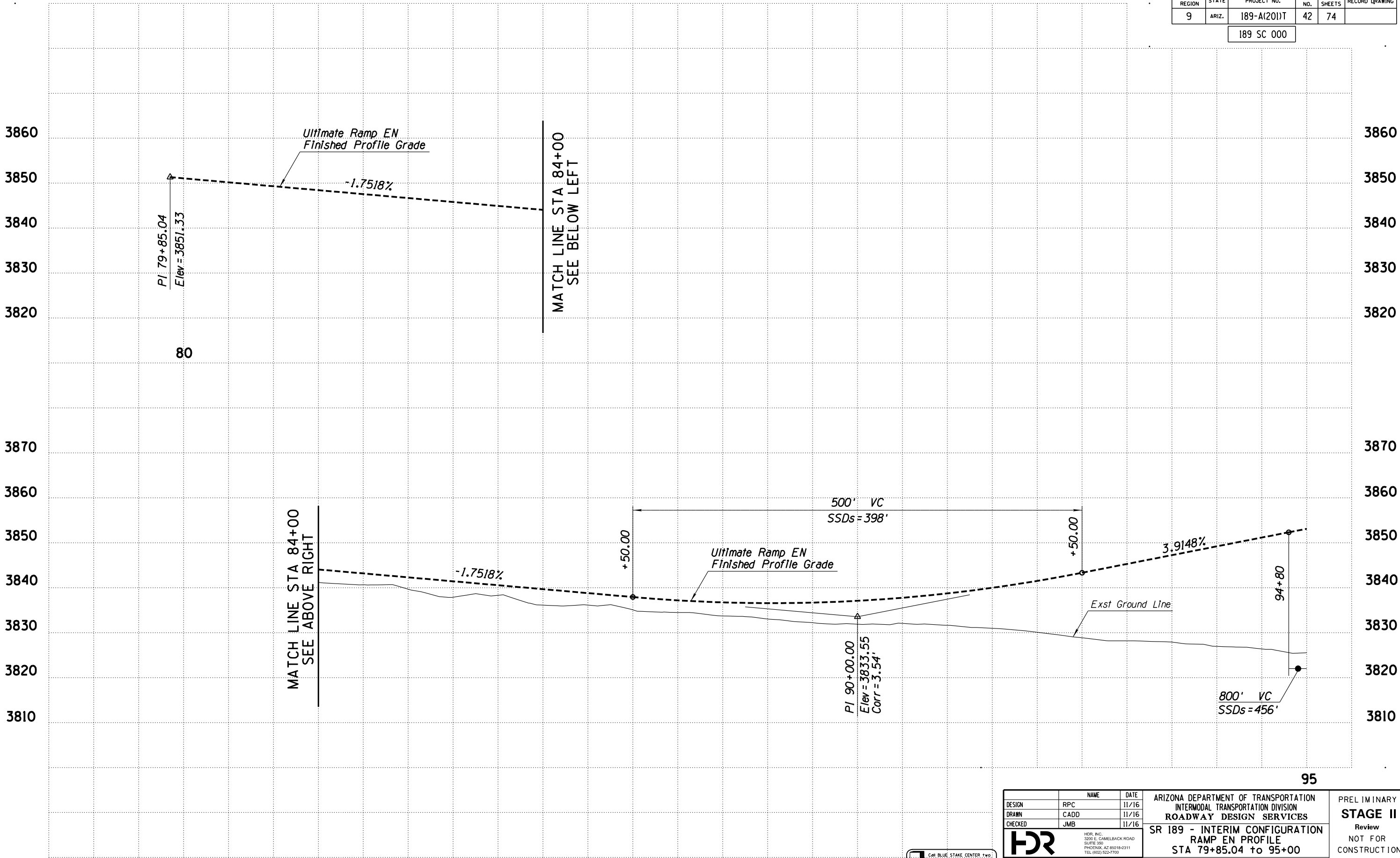
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DESIGN	RPC				11/16			<b>STAGE II</b>	
DRAWN	CADD				11/16				
CHECKED	JMB				11/16				
		HDR, INC. 3200 E. CAMELBACK ROAD SUITE 300 PHOENIX, AZ 85018-2311 TEL (602) 922-7700				I-19 - ULTIMATE CONFIGURATION PLAN SHEET Sta 232+00 to 245+00		Review	
		ROUTE		LOCATION				NOT FOR CONSTRUCTION OR RECORDING	
		SR 189		INTERNATIONAL BORDER TO GRAND AVENUE					
TRACS NO. H8045 OIL				189-SC-000		DWG NO. C-01.26		____ OF ____	

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F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	RECORD DRAWING
9	ARIZ.	189-AI(20)IT	42	74	

189 SC 000




85



		NAME	DATE	ARIZONA DEPARTMENT OF TRANSPORTATION INTERMODAL TRANSPORTATION DIVISION ROADWAY DESIGN SERVICES	PRELIMINARY <b>STAGE II</b> Review NOT FOR CONSTRUCTION OR RECORDING
DESIGN		RPC	11/16		
DRAWN		CADD	11/16		
CHECKED		JMB	11/16		
		HDR, INC. 3001 E. CAMELBACK ROAD SUITE 350 PHOENIX, AZ 85018-0311 TEL: (602) 562-7700		SR 189 - INTERIM CONFIGURATION RAMP EN PROFILE STA 79+85.04 to 95+00	
ROUTE		LOCATION			DWG NO. C-02.01
SR 189		INTERNATIONAL BORDER TO GRAND AVENUE			
TRACS NO. H8045 OIL				189-SC-000	___ <i>OF</i> ___

189 SC 000

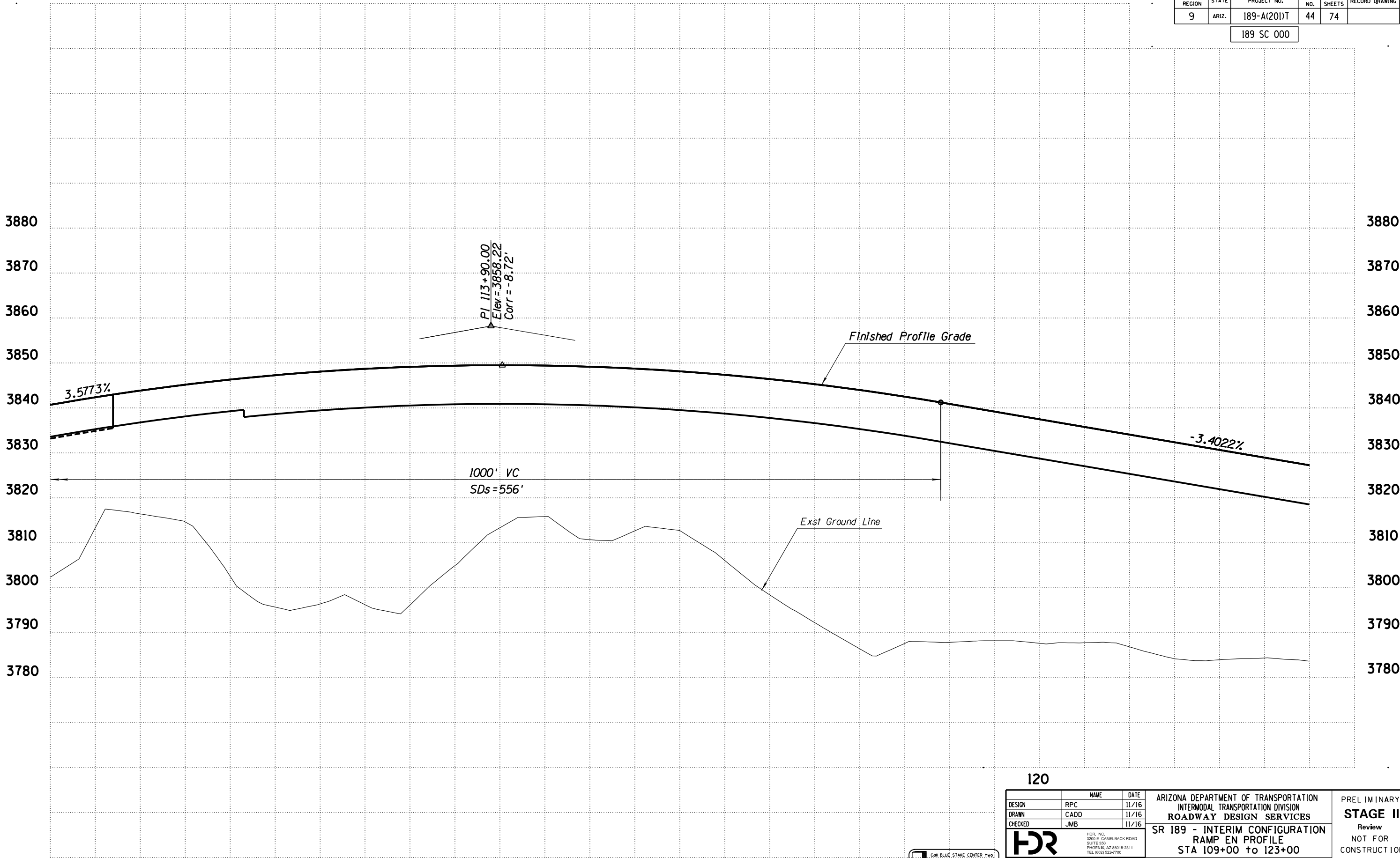
		NAME	DATE	ARIZONA DEPARTMENT OF TRANSPORTATION INTERMODAL TRANSPORTATION DIVISION ROADWAY DESIGN SERVICES		PRELIMINARY <b>STAGE II</b> Review NOT FOR CONSTRUCTION OR RECORDING
DESIGN		RPC	11/16			
DRAWN		CADD	11/16			
CHECKED		JMB	11/16			
		HDR, INC. 3000 E. CAMELLBACK ROAD SUITE 350 PHOENIX, AZ 85018-0311 TEL (602) 522-7700		SR 189 - INTERIM CONFIGURATION RAMP EN PROFILE STA 95+00 to 109+00		
ROUTE		LOCATION				
SR 189		INTERNATIONAL BORDER TO GRAND AVENUE				DWG NO. C-02.02
TRACS NO. H8045 OIL				189-SC-000		OF



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PLOT DATE: Nov, 16, 2016  
TIME: 10:21:00 AM  
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PLOT BY: AHOFFMAN  
DATE: \_\_\_\_\_  
LOCATION: \_\_\_\_\_  
REVISIONS: \_\_\_\_\_  
FINISHED PLANS: \_\_\_\_\_  
SURVEY NO. \_\_\_\_\_

F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	RECORD DRAWING
9	ARIZ.	189-A(20)IT	44	74	

189 SC 000




110

115

120



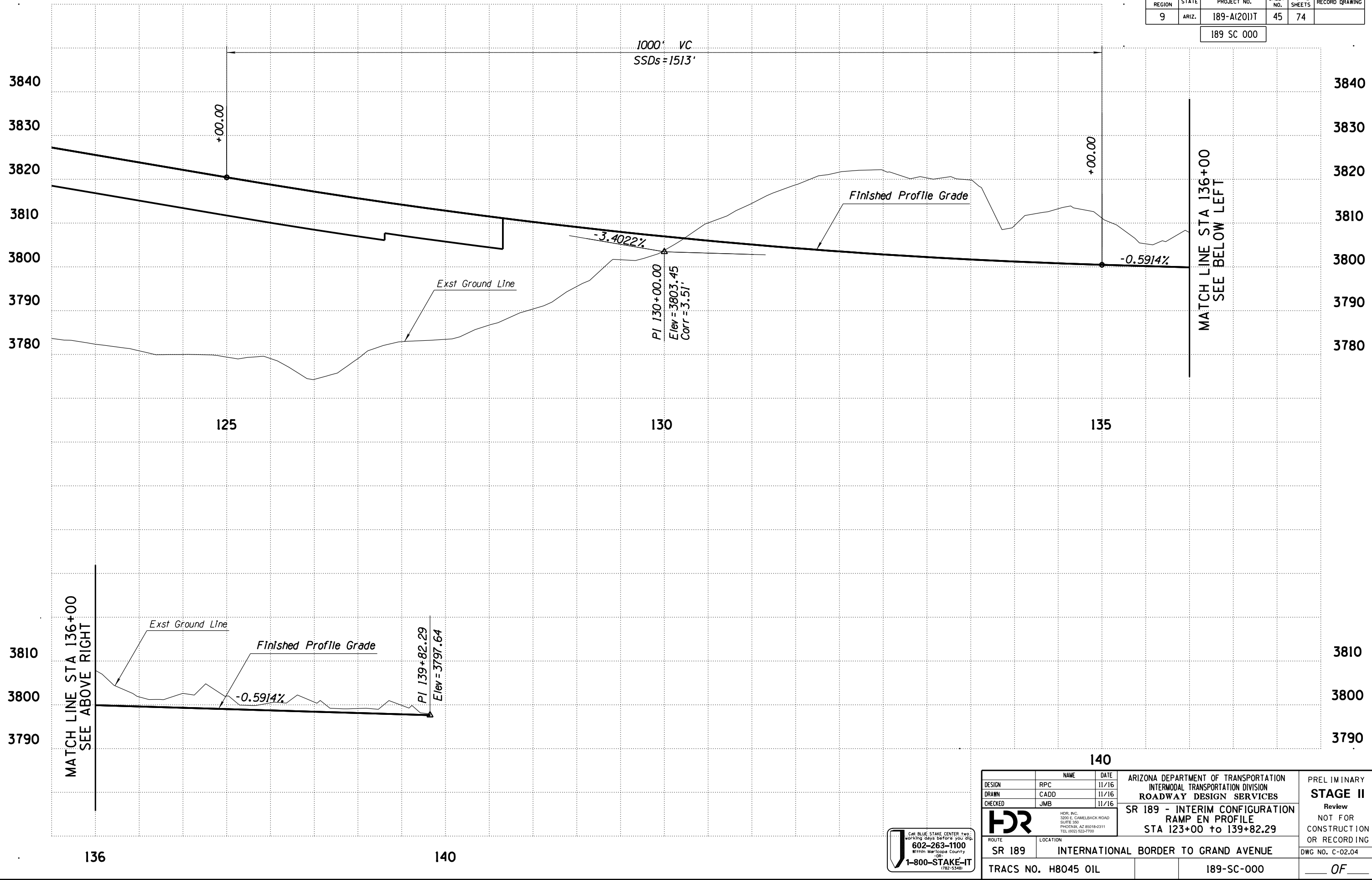
		NAME		DATE		ARIZONA DEPARTMENT OF TRANSPORTATION INTERMODAL TRANSPORTATION DIVISION ROADWAY DESIGN SERVICES		PRELIMINARY <b>STAGE II</b> Review NOT FOR CONSTRUCTION OR RECORDING	
DESIGN		RPC		11/16					
DRAWN		CADD		11/16					
CHECKED		JMB		11/16		SR 189 - INTERIM CONFIGURATION RAMP EN PROFILE STA 109+00 to 123+00		DWG NO. C-02.03	
<div><div>HDR, INC. 3200 E. CAMELBACK ROAD SUITE 350 PHOENIX, AZ 85018-2311 TEL: (602) 522-7700</div></div>									
ROUTE		LOCATION							
SR 189		INTERNATIONAL BORDER TO GRAND AVENUE							
TRACS NO. H8045 OIL						189-SC-000		___ OF ___	

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SURVEY NO. FINISHED PLANS REVISIONS LOCATION DATE

F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	RECORD DRAWING
9	ARIZ.	189-A(20)IT	45	74	

189 SC 000

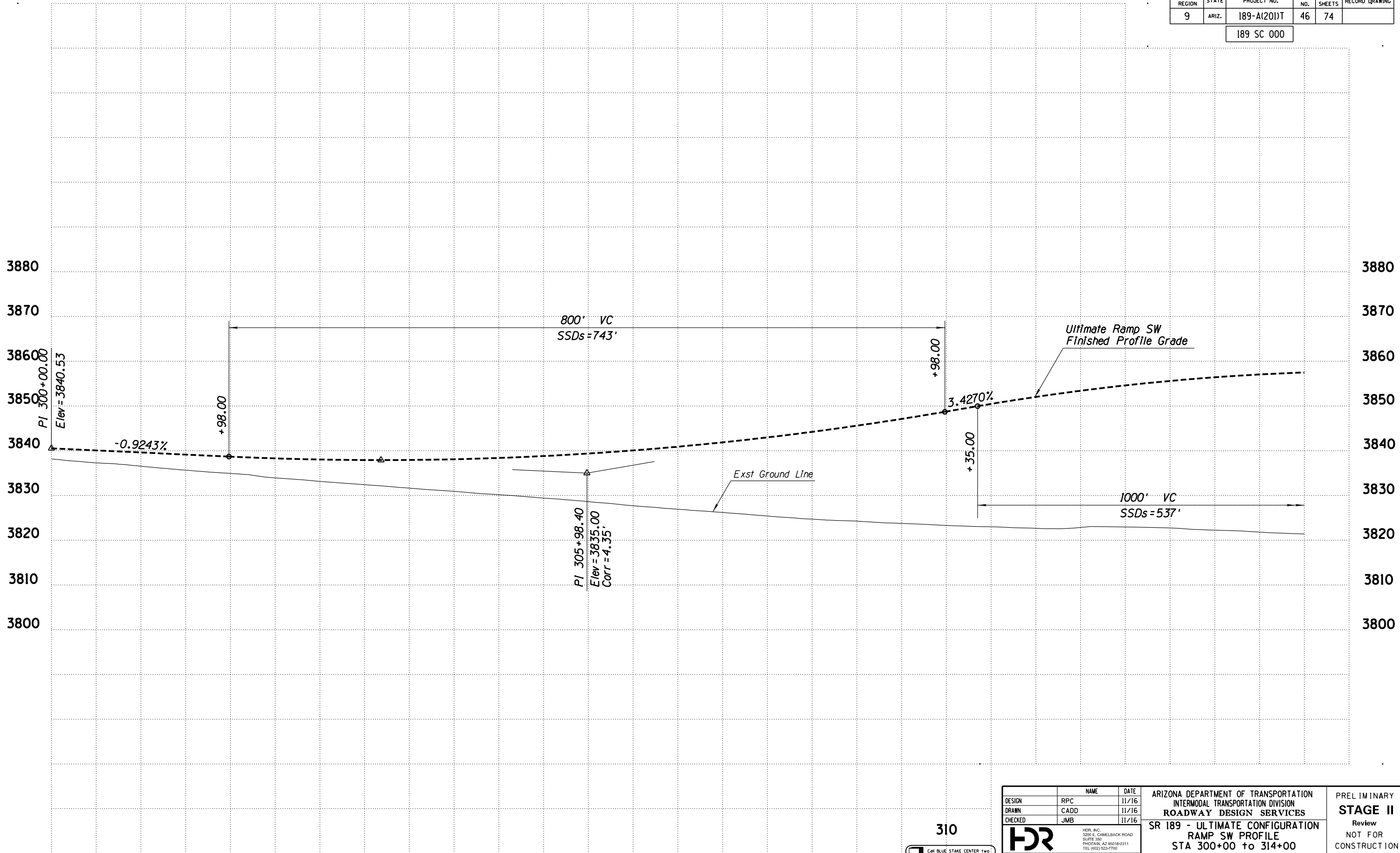


DESIGN	NAME	DATE	ARIZONA DEPARTMENT OF TRANSPORTATION INTERMODAL TRANSPORTATION DIVISION ROADWAY DESIGN SERVICES	PRELIMINARY STAGE II Review NOT FOR CONSTRUCTION OR RECORDING
DRAWN	RPC	11/16		
CHECKED	CADD	11/16		
CHECKED	JMB	11/16		
ROUTE	LOCATION		SR 189 - INTERIM CONFIGURATION RAMP EN PROFILE STA 123+00 to 139+82.29	DWG NO. C-02.04
SR 189	INTERNATIONAL BORDER TO GRAND AVENUE			
TRACS NO. H8045 OIL			189-SC-000	OF

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LOCATION: \_\_\_\_\_  
REVISIONS: \_\_\_\_\_  
FINISHED PLANS: \_\_\_\_\_  
SURVEY NO. \_\_\_\_\_


F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	RECORD DRAWING
9	ARIZ.	189-AI(20)IT	46	74	

189 SC 000



310

Call BLUE STAKE CENTER two working days before you dig.  
**602-263-1100**  
Within Maricopa County  
OR  
**1-800-STAKE-IT**  
(782-5548)

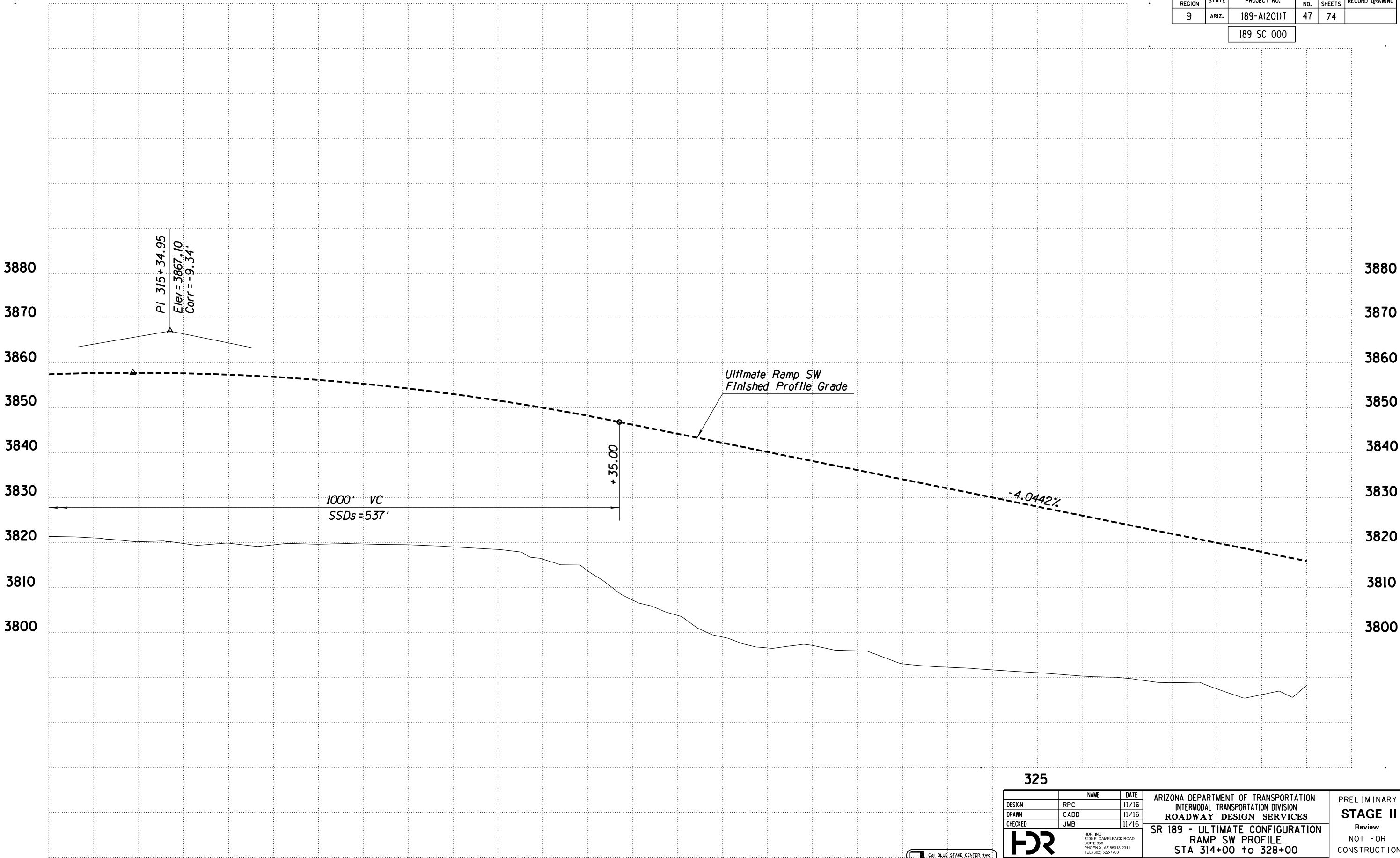
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DESIGN	RPC				11/16			STAGE II	
DRAWN	CADD				11/16				
CHECKED	JMB				11/16				
		HDR, INC. 3206 E. CANNELBACK ROAD SUITE 300 PHOENIX, AZ 85018-2311 TEL 602/921-0270				SR 189 - ULTIMATE CONFIGURATION RAMP SW PROFILE STA 300+00 to 314+00			
		ROUTE		LOCATION					
SR 189		INTERNATIONAL BORDER TO GRAND AVENUE						Review NOT FOR CONSTRUCTION OR RECORDING	
								DWG NO. C-02.05	
TRACS NO. H8045 OIL						189-SC-000		____ OF ____	

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SURVEY NO.	FINISHED PLANS	REVISIONS	LOCATION	DATE

F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	RECORD DRAWING
9	ARIZ.	189-AI(20)IT	47	74	

189 SC 000




315

320

325



		NAME		DATE		ARIZONA DEPARTMENT OF TRANSPORTATION INTERMODAL TRANSPORTATION DIVISION ROADWAY DESIGN SERVICES		PRELIMINARY <b>STAGE II</b>  Review NOT FOR CONSTRUCTION OR RECORDING							
DESIGN		RPC		11/16											
DRAWN		CADD		11/16											
CHECKED		JMB		11/16											
						HDR, INC. 3200 E. CAMELBACK ROAD SUITE 350 PHOENIX, AZ 85018-2311 TEL: (602) 522-7700									
ROUTE						LOCATION						SR 189 - ULTIMATE CONFIGURATION RAMP SW PROFILE STA 314+00 to 328+00			
SR 189						INTERNATIONAL BORDER TO GRAND AVENUE									
TRACS NO. H8045 OIL										189-SC-000				DWG NO. C-02.06	
														____ OF ____	

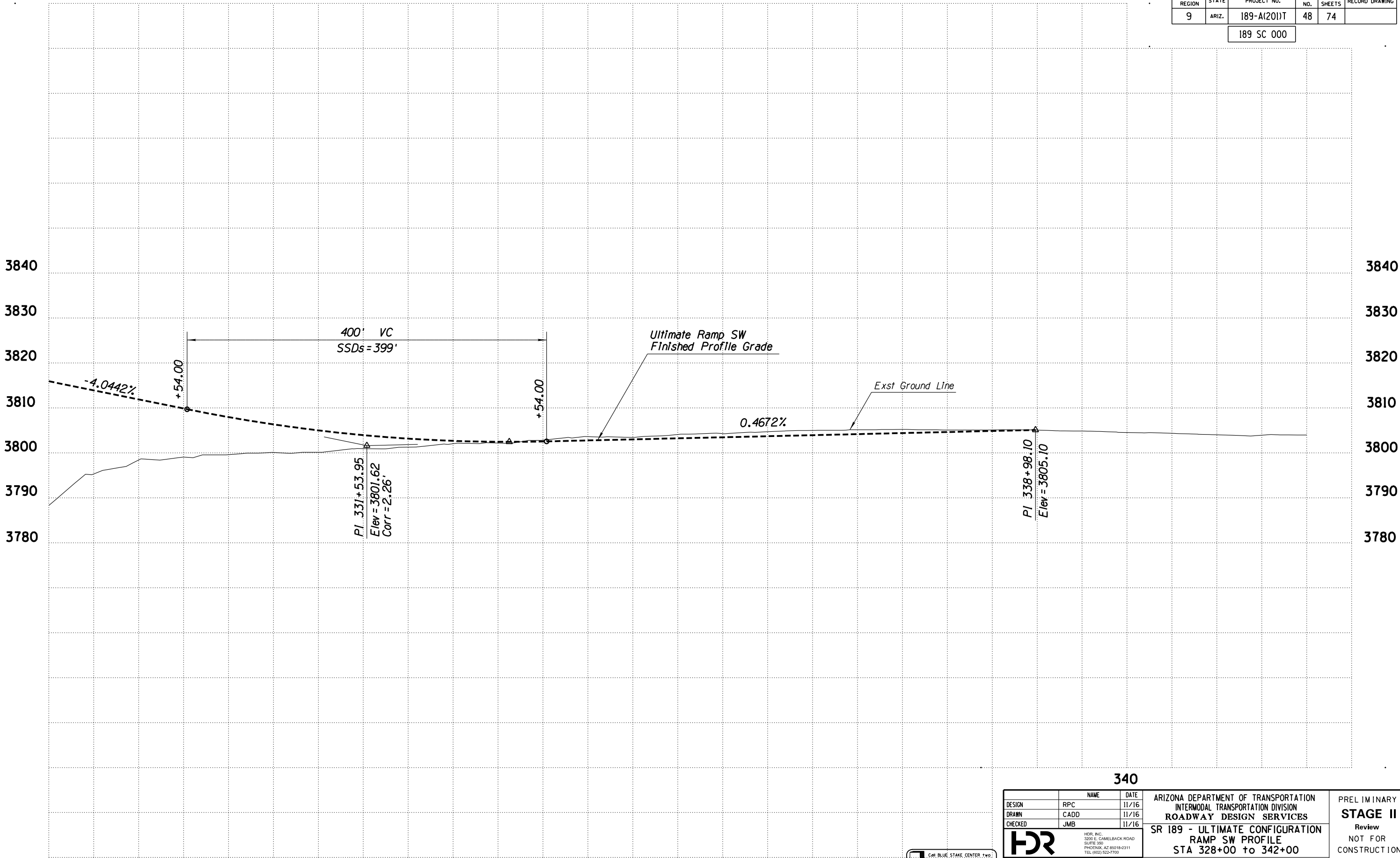


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SURVEY NO. FINISHED PLANS REVISIONS DATE LOCATION

F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	RECORD DRAWING
9	ARIZ.	189-AI(20)IT	48	74	

189 SC 000



330

335

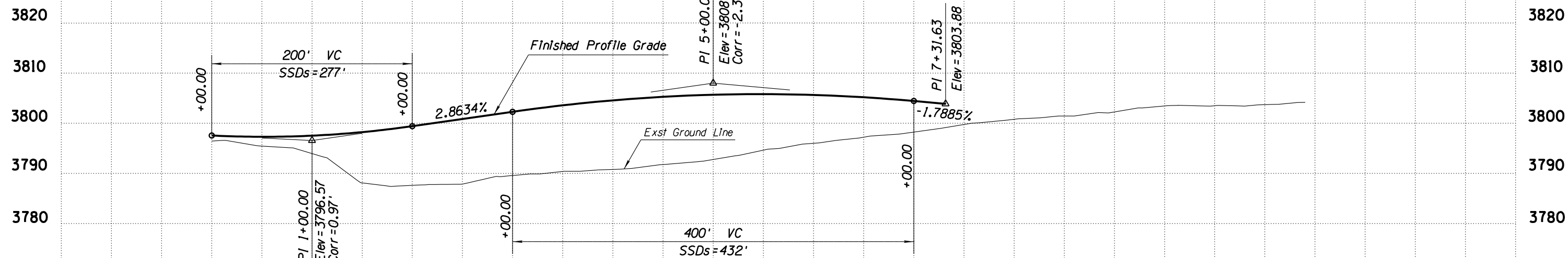
340



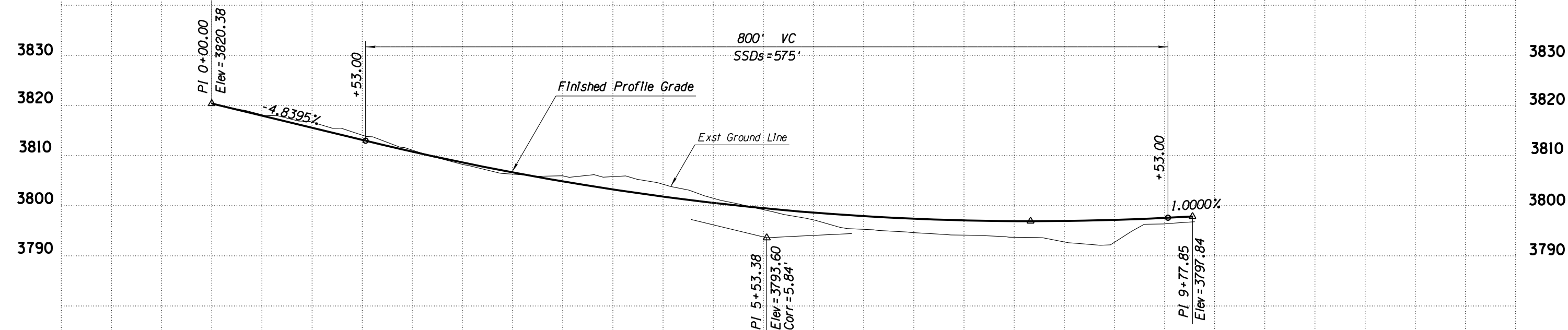
DESIGN	RPC	NAME	DATE	ARIZONA DEPARTMENT OF TRANSPORTATION INTERMODAL TRANSPORTATION DIVISION ROADWAY DESIGN SERVICES		PRELIMINARY <b>STAGE II</b> Review NOT FOR CONSTRUCTION OR RECORDING
DRAWN	CADD		11/16			
CHECKED	JMB		11/16			
ROUTE		LOCATION		SR 189 - ULTIMATE CONFIGURATION RAMP SW PROFILE STA 328+00 to 342+00		DWG NO. C-02.07
SR 189		INTERNATIONAL BORDER TO GRAND AVENUE		TRACS NO. H8045 OIL		189-SC-000
						OF

F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	RECORD DRAWING
9	ARIZ.	189-A(201)T	49	74	

189 SC 000




# ULTIMATE I-19 RAMP A



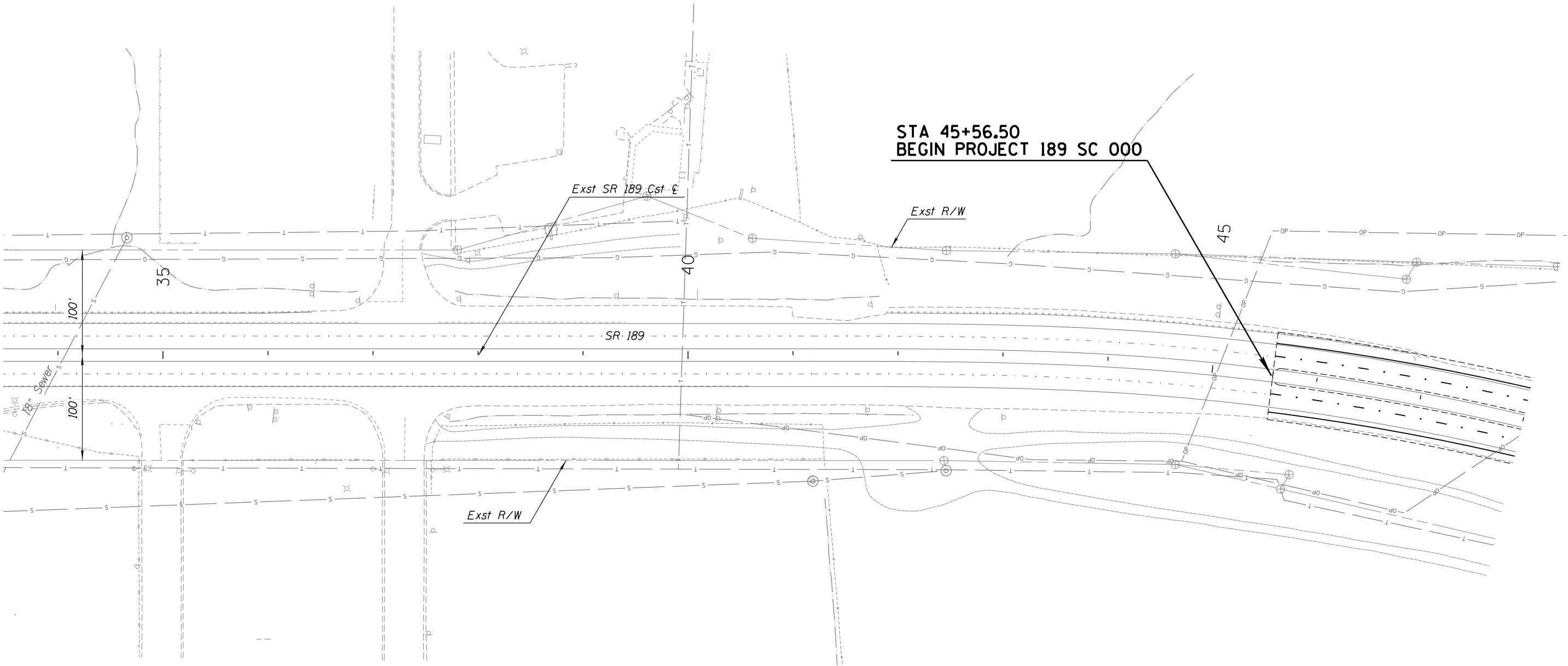
# ULTIMATE I-19 RAMP D




		NAME		DATE	ARIZONA DEPARTMENT OF TRANSPORTATION INTERMODAL TRANSPORTATION DIVISION ROADWAY DESIGN SERVICES	PRELIMINARY  <b>STAGE II</b>  Review NOT FOR CONSTRUCTION OR RECORDING	
DESIGN		RPC		11/16			
DRAWN		CADD		11/16			
CHECKED		JMB		11/16			
		<div>HDR, INC. 3200 N. E. CAMELBACK ROAD SUITE 330 PHOENIX, AZ 85018-2311 TEL (602) 522-7700</div>			I-19 - ULTIMATE CONFIGURATION I-19 RAMP A PROFILE I-19 RAMP D PROFILE		
ROUTE		LOCATION					DWG NO. C-02.08
SR 189		INTERNATIONAL BORDER TO GRAND AVENUE					
TRACS NO. H8045 OIL					189-SC-000	OF	

F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	RECORD DRAWING
9	ARIZ.	189-A(20)IT	50	74	

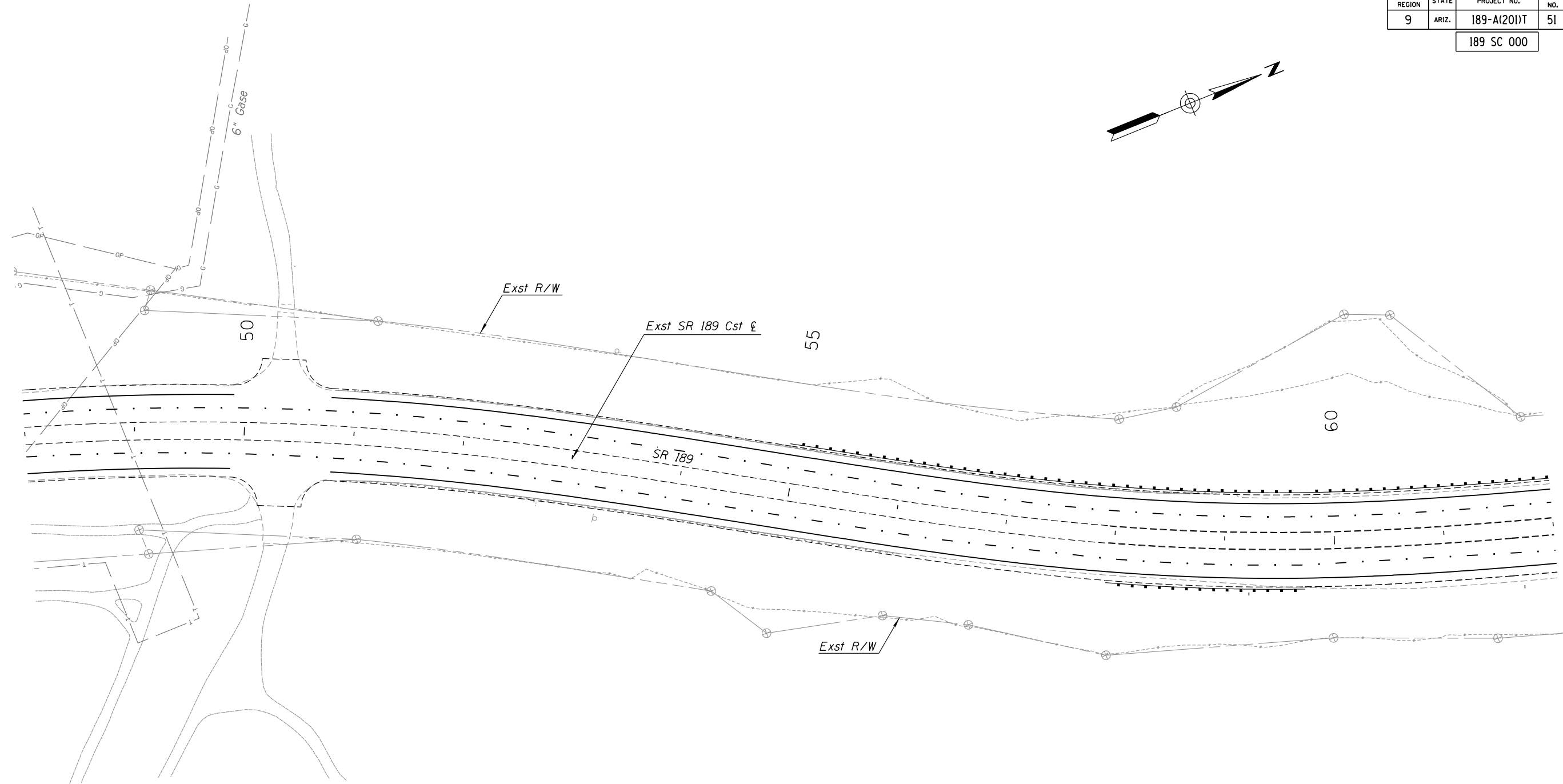
189 SC 000



		NAME	DATE	ARIZONA DEPARTMENT OF TRANSPORTATION INTERMODAL TRANSPORTATION DIVISION TRAFFIC DESIGN SERVICES	PRELIMINARY <b>STAGE II</b>  Review NOT FOR CONSTRUCTION OR RECORDING
DESIGN	SD		11/16		
DRAWN	CADD		11/16		
CHECKED	JNR		11/16		
				SR 189 - INTERIM CONFIGURATION GUIDE SIGN CONCEPT PLAN Sta 34+00 to 48+00	
HDR, INC. 3206 E. CAMELBACK ROAD SUITE 300 PHOENIX, AZ 85018-2311 TEL (602) 922-7700					
ROUTE		LOCATION		SR 189 INTERNATIONAL BORDER TO GRAND AVENUE	DWG NO. T-01.01
SR 189					
TRACS NO. H8045 OIL			189-SC-000		___ OF ___

F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	RECORD DRAWING
9	ARIZ.	189-A(20)IT	51	74	

189 SC 000

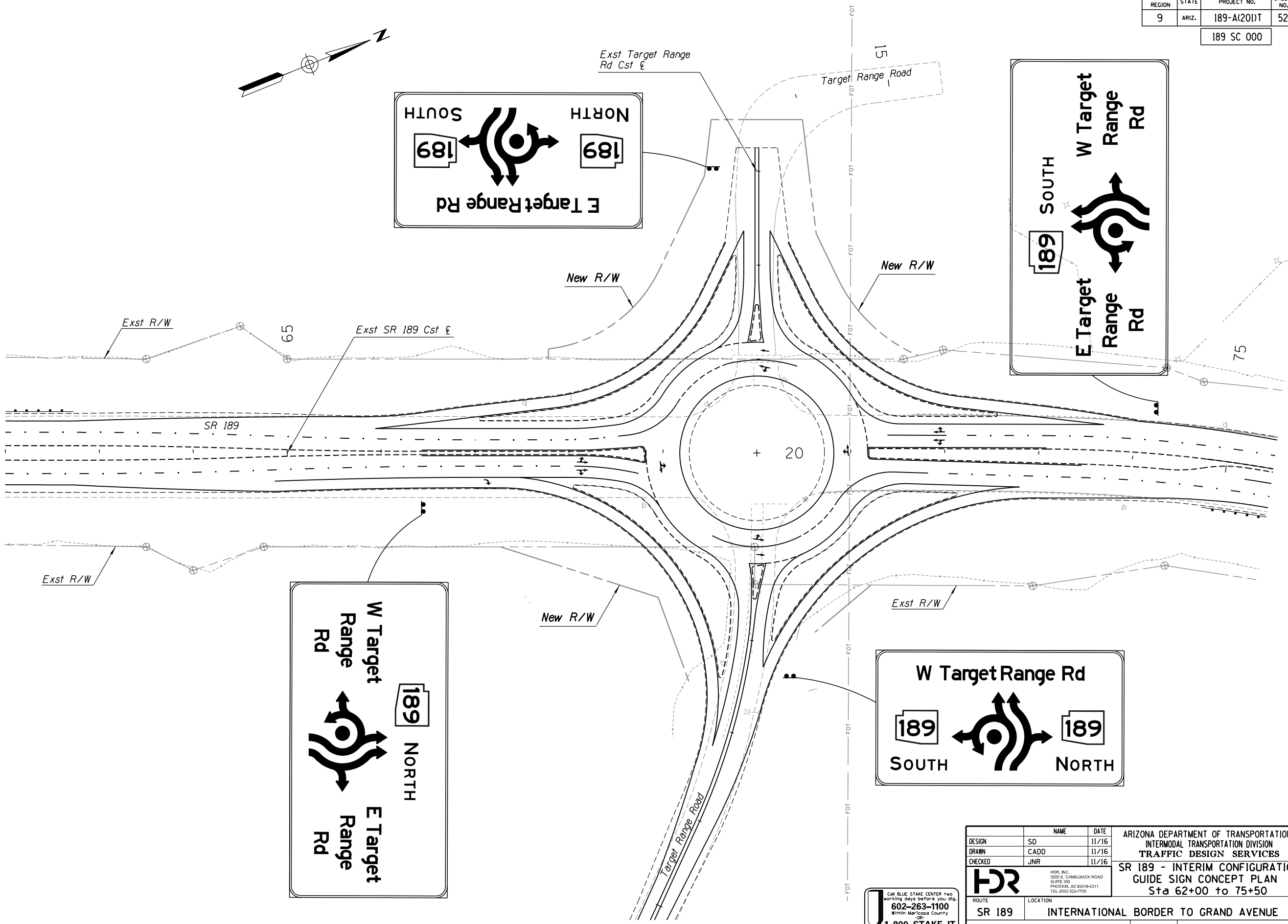



DESIGN	SD	NAME	DATE	ARIZONA DEPARTMENT OF TRANSPORTATION INTERMODAL TRANSPORTATION DIVISION TRAFFIC DESIGN SERVICES	PRELIMINARY <b>STAGE II</b> Review NOT FOR CONSTRUCTION OR RECORDING
DRAWN	CADD		11/16		
CHECKED	JNR		11/16		
<b>SR 189 - INTERIM CONFIGURATION GUIDE SIGN CONCEPT PLAN Sta 48+00 to 62+00</b>					
ROUTE	LOCATION				DWG NO. T-01.02
SR 189	INTERNATIONAL BORDER TO GRAND AVENUE				
TRACS NO. H8045 OIL				189-SC-000	OF



F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	RECORD DRAWING
9	ARIZ.	189-A(20)IT	52	74	

189 SC 000



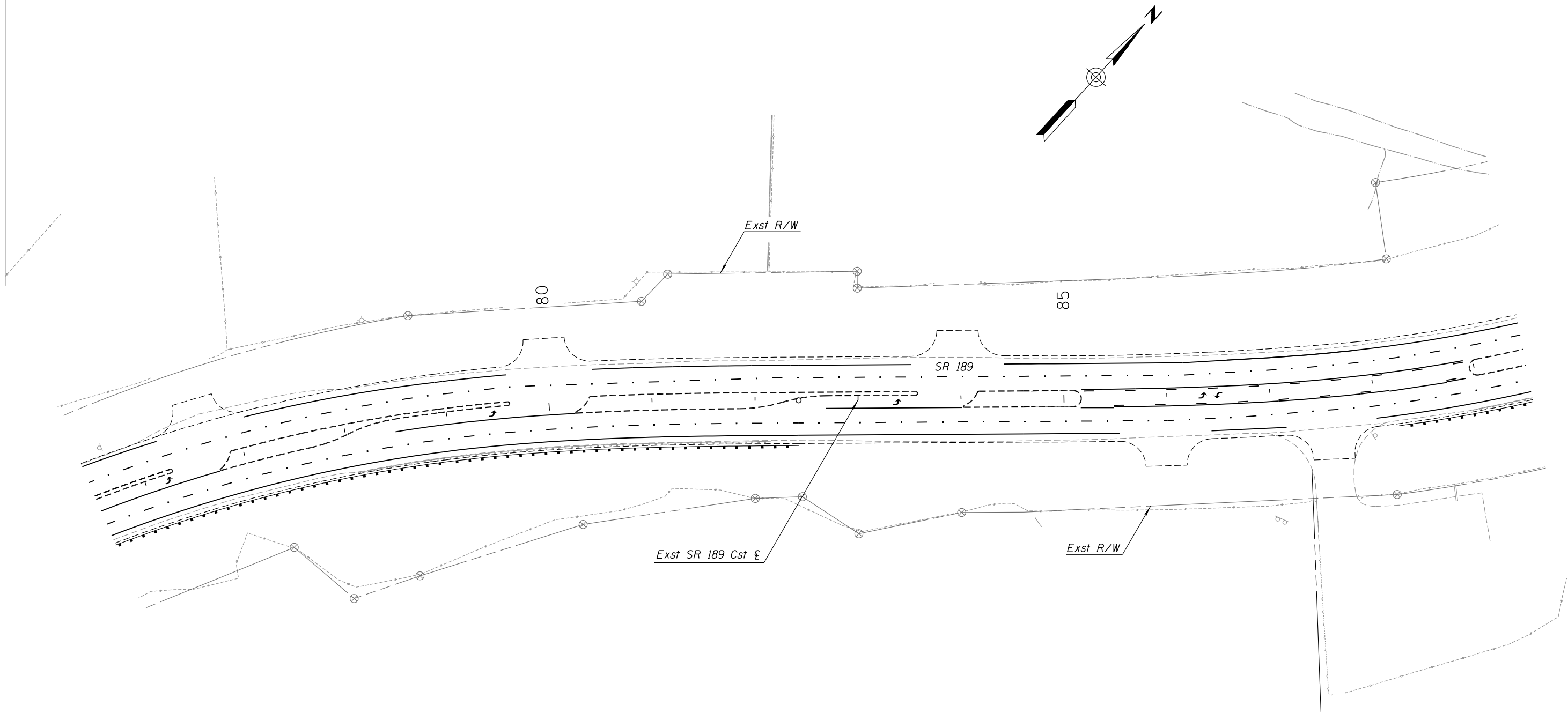
		NAME	DATE	ARIZONA DEPARTMENT OF TRANSPORTATION INTERMODAL TRANSPORTATION DIVISION TRAFFIC DESIGN SERVICES	PRELIMINARY <b>STAGE II</b> Review NOT FOR CONSTRUCTION OR RECORDING
DESIGN	SD		11/16		
DRAWN	CADD		11/16		
CHECKED	JNR		11/16		
		HDR, INC. 3200 E. CAMELBACK ROAD SUITE 350 PHOENIX, AZ 85018-2311 TEL: (602) 522-7700		SR 189 - INTERIM CONFIGURATION GUIDE SIGN CONCEPT PLAN Sta 62+00 to 75+50	DWG NO. T-01.03
ROUTE	LOCATION				
SR 189	INTERNATIONAL BORDER TO GRAND AVENUE				
TRACS NO. H8045 OIL				189-SC-000	___ OF ___


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**602-263-1100**  
Within Maricopa County  
OR  
**1-800-STAKE-IT**  
(182-5548)

FILE NAME: c:\pwworking\phx\0486934\h8045\04.dgn  
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TIME: 10:22:22 AM  
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PLOT BY: AHOFFMAN  
DATE: LOCATION: REVISIONS: FINISHED PLANS: SURVEY NO. DATE: LOCATION: REVISIONS: FINISHED PLANS: SURVEY NO.

F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	RECORD DRAWING
9	ARIZ.	189-A(20)IT	53	74	

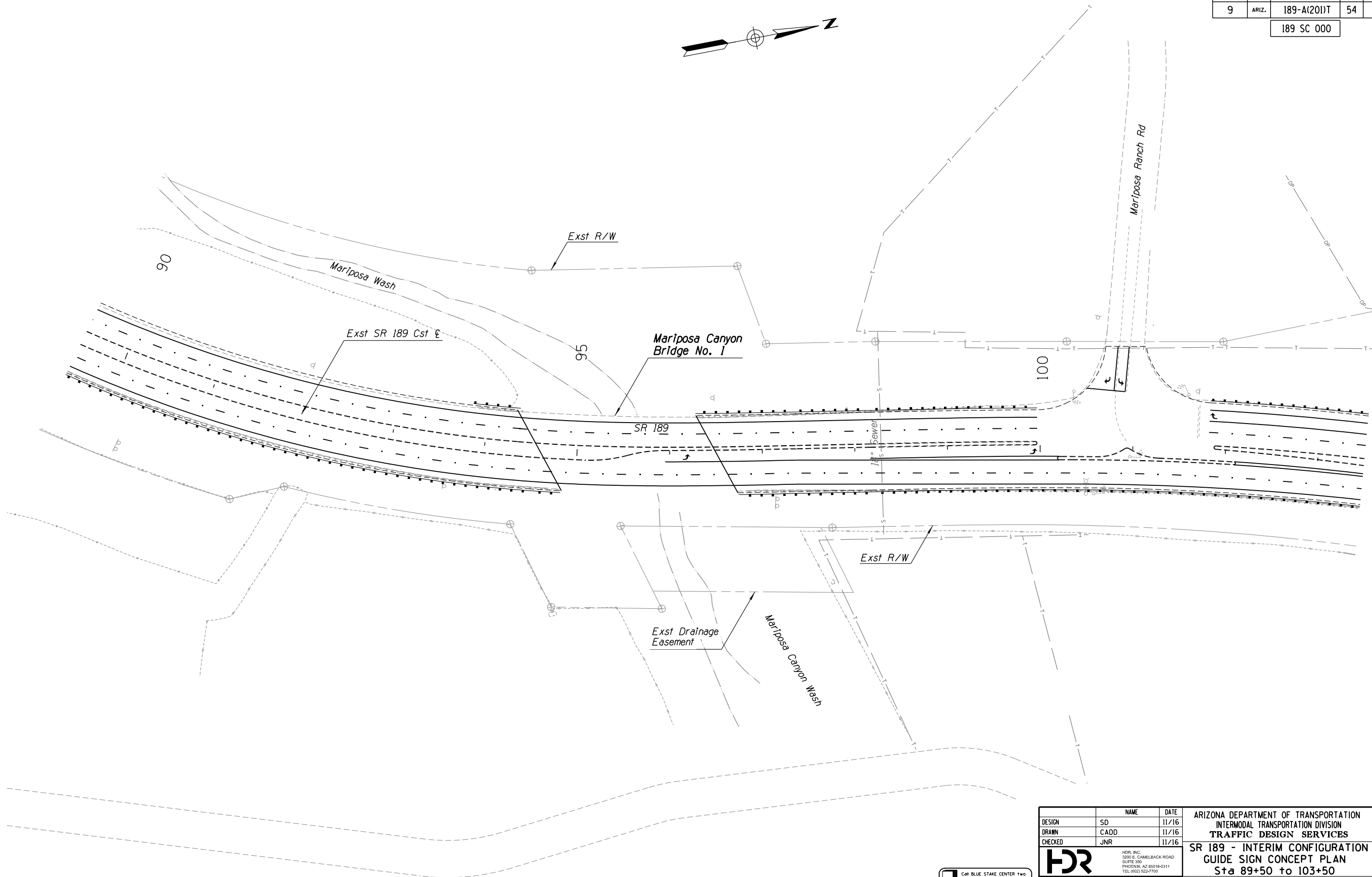
189 SC 000




		NAME	DATE	ARIZONA DEPARTMENT OF TRANSPORTATION INTERMODAL TRANSPORTATION DIVISION TRAFFIC DESIGN SERVICES	PRELIMINARY <b>STAGE II</b> Review NOT FOR CONSTRUCTION OR RECORDING	
DESIGN		SD	11/16			
DRAWN		CADD	11/16			
CHECKED		JNR	11/16			
		HDR, INC. 3200 E. CAMELBACK ROAD SUITE 300 PHOENIX, AZ 85018-2311 TEL: (602) 522-7700		SR 189 - INTERIM CONFIGURATION GUIDE SIGN CONCEPT PLAN Sta 75+50 to 89+50		
ROUTE		LOCATION				DWG NO. T-01.04
SR 189		INTERNATIONAL BORDER TO GRAND AVENUE				
TRACS NO. H8045 OIL				189-SC-000	___ OF ___	

F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	RECORD DRAWING
9	ARIZ.	189-A(20)1T	54	74	

189 SC 000



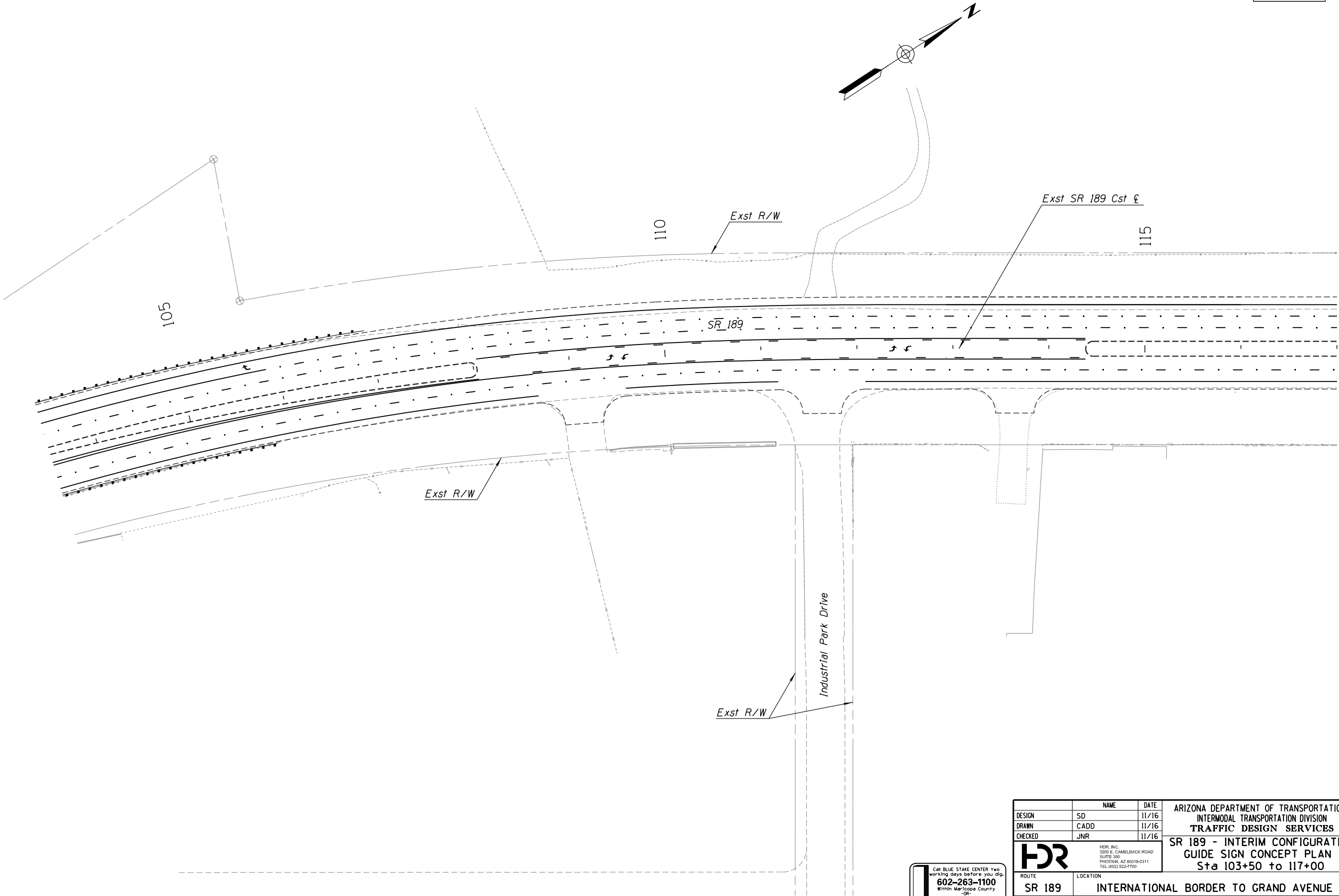
Call BLUE STAKE CENTER two working days before you die  
**602-263-1100**  
Within Maricopa County  
-OR-  
**1-800-STAKE-1**  
(782-6348)

		NAME	DATE	ARIZONA DEPARTMENT OF TRANSPORTATION INTERMODAL TRANSPORTATION DIVISION TRAFFIC DESIGN SERVICES  SR 189 - INTERIM CONFIGURATION GUIDE SIGN CONCEPT PLAN Sta 89+50 to 103+50	PRELIMINARY  STAGE II  Review NOT FOR CONSTRUCTION OR RECORDING
DESIGN		SD	11/16		
DRAWN		CADD	11/16		
CHECKED		JNR	11/16		
		HDR, INC. 3500 E. CAMELBACK ROAD SUITE 350 PHOENIX, AZ 85018-0311 TEL (602) 522-7700			
ROUTE	LOCATION				
SR 189	INTERNATIONAL BORDER TO GRAND AVENUE				
TRACS NO. H8045 OIL			189-SC-000		OF


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PLOT BY: AHOFFMAN  
DATE: LOCATION: REVISIONS: FINISHED PLANS: SURVEY NO. DATE: LOCATION: REVISIONS: FINISHED PLANS: SURVEY NO.

F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	RECORD DRAWING
9	ARIZ.	189-A(20)IT	55	74	

189 SC 000



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working days before you dig.  
**602-263-1100**  
Within Maricopa County  
OR  
**1-800-STAKE-IT**  
(182-5548)

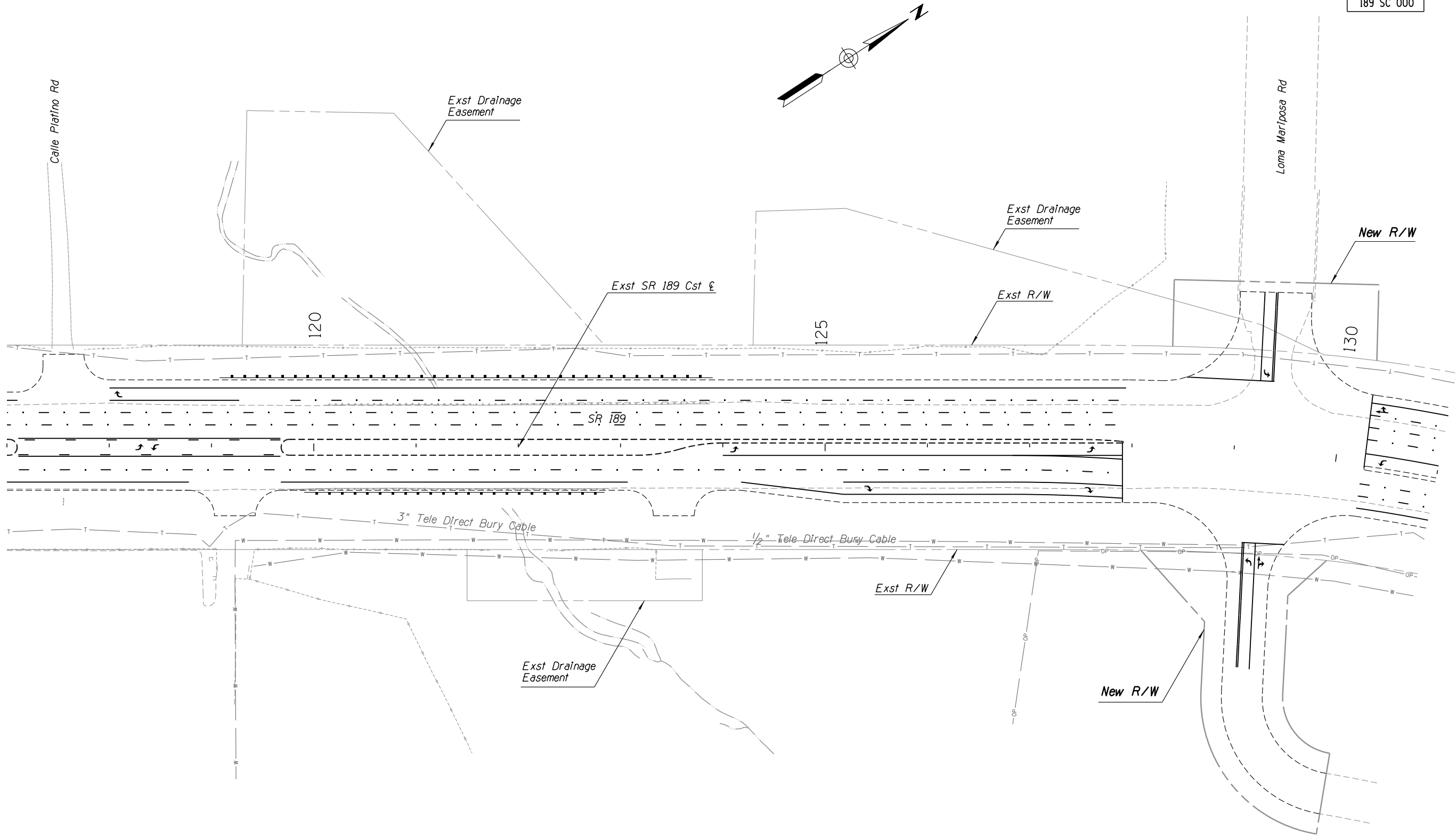
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DESIGN		SD	11/16			
DRAWN		CADD	11/16			
CHECKED		JNR	11/16			
		HDR, INC. 3200 E. CAMELBACK ROAD SUITE 300 PHOENIX, AZ 85018-2311 TEL: (602) 522-7700				
ROUTE		LOCATION				
SR 189		INTERNATIONAL BORDER TO GRAND AVENUE				DWG NO. T-01.06
TRACS NO. H8045 OIL					189-SC-000	___ OF ___


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SURVEY NO. FINISHED PLANS REVISIONS DATE LOCATION

F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	RECORD DRAWING
9	ARIZ.	189-A(20)IT	56	74	

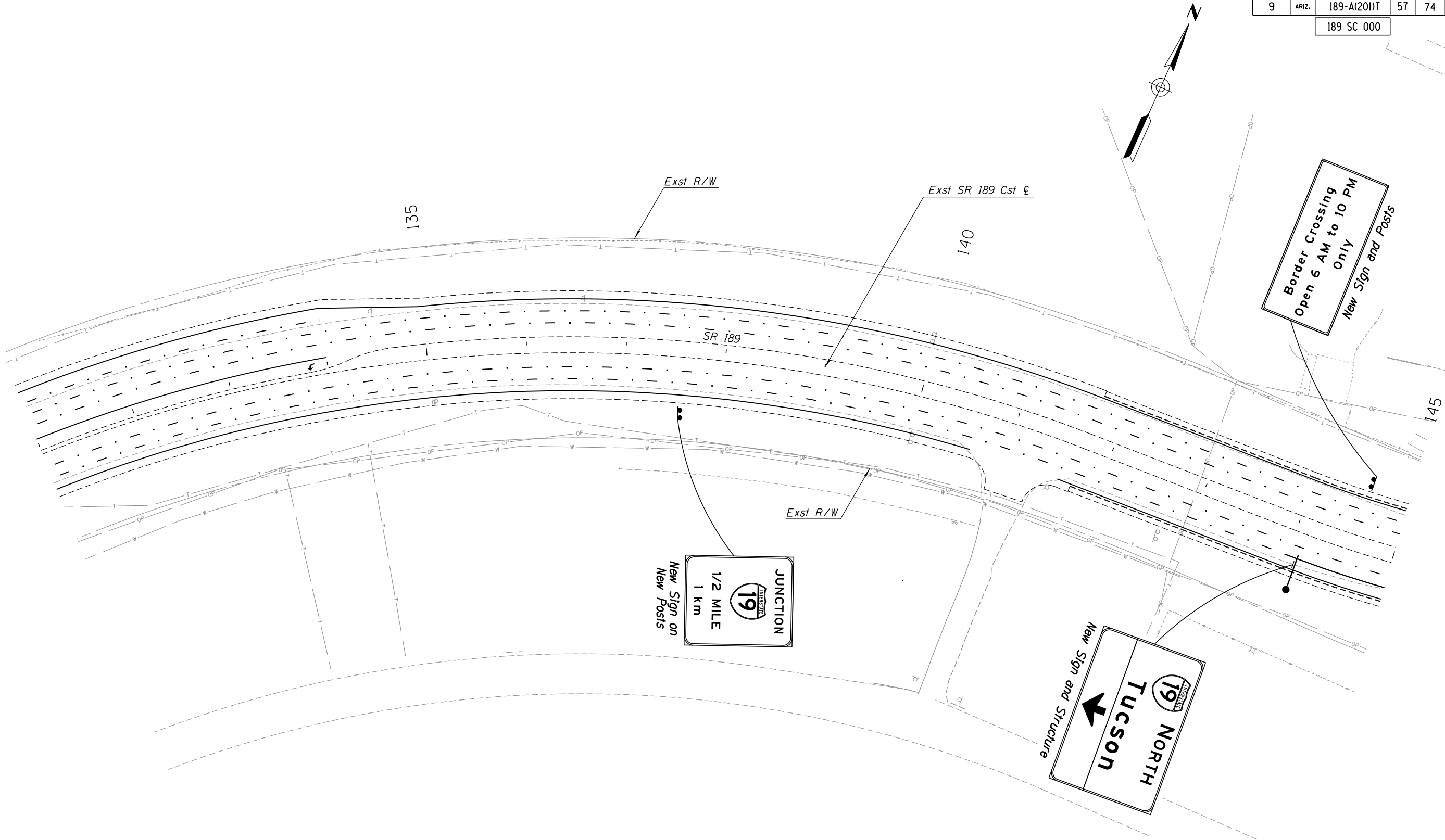
189 SC 000




		NAME	DATE	ARIZONA DEPARTMENT OF TRANSPORTATION INTERMODAL TRANSPORTATION DIVISION TRAFFIC DESIGN SERVICES  SR 189 - INTERIM CONFIGURATION GUIDE SIGN CONCEPT PLAN Sta 117+00 to 131+00	PRELIMINARY <b>STAGE II</b> Review NOT FOR CONSTRUCTION OR RECORDING
DESIGN		SD	11/16		
DRAWN		CADD	11/16		
CHECKED		JNR	11/16		
		HDR, INC. 3200 E. CAMELBACK ROAD SUITE 320 PHOENIX, AZ 85018-2311 TEL. (602) 922-7700			
ROUTE		LOCATION		DWG NO. T-01.07	
SR 189		INTERNATIONAL BORDER TO GRAND AVENUE			
TRACS NO. H8045 OIL		189-SC-000			
				___ OF ___	



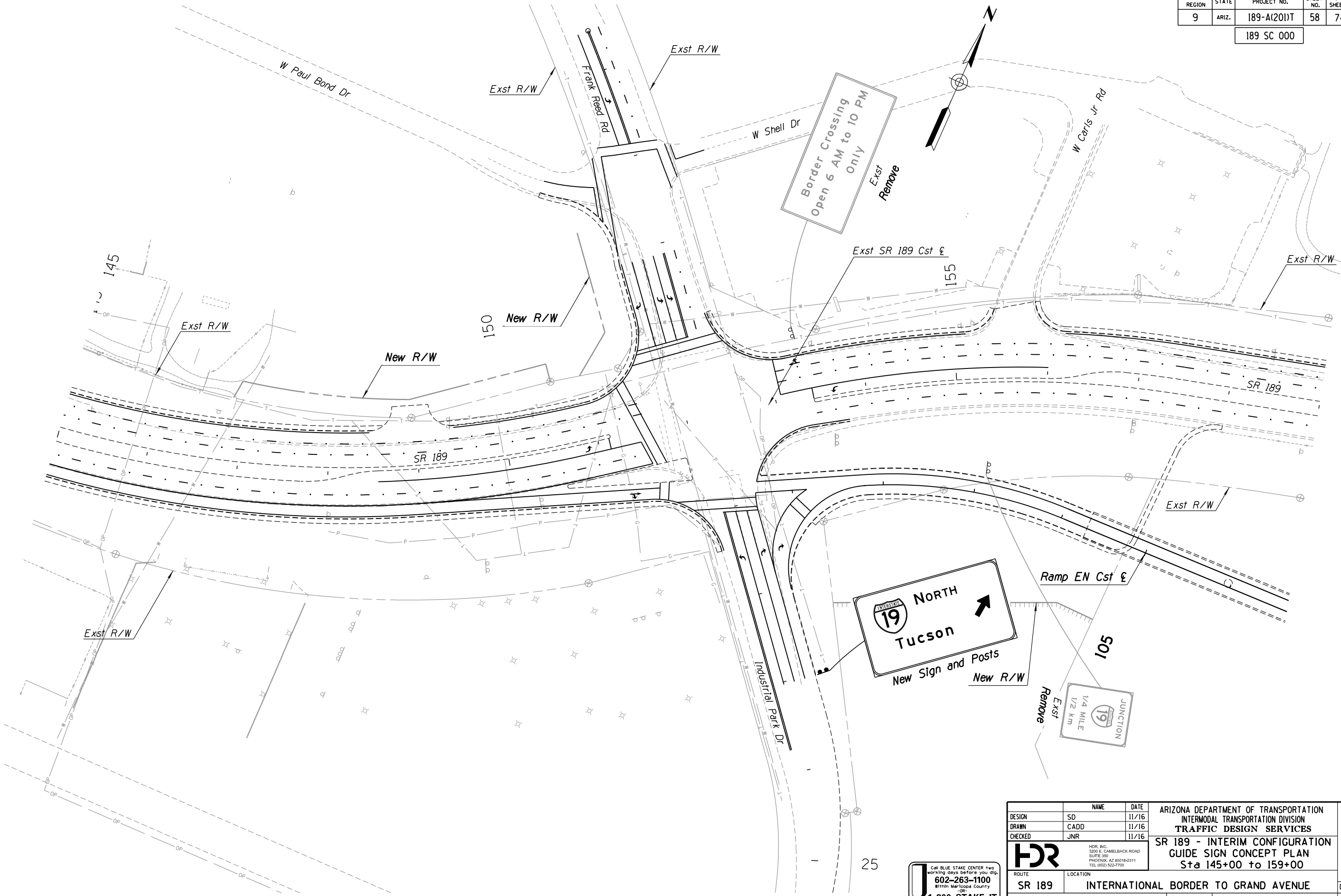
F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	RECORD DRAWING
9	ARIZ.	189-A(20)IT	57	74	
189 SC 000					




		NAME	DATE	ARIZONA DEPARTMENT OF TRANSPORTATION INTERMODAL TRANSPORTATION DIVISION TRAFFIC DESIGN SERVICES	PRELIMINARY <b>STAGE II</b> Review NOT FOR CONSTRUCTION OR RECORDING
DESIGN		SD	11/16		
DRAWN		CADD	11/16		
CHECKED		JNR	11/16		
		HDR, INC. 3200 E. CAMELBACK ROAD SUITE 300 PHOENIX, AZ 85018-2311 TEL. (602) 952-7700		SR 189 - INTERIM CONFIGURATION GUIDE SIGN CONCEPT PLAN Sta 131+00 to 145+00	DWG NO. T-01.08
ROUTE		LOCATION			
SR 189		INTERNATIONAL BORDER TO GRAND AVENUE			
TRACS NO. H8045 OIL				189-SC-000	___ OF ___

F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	RECORD DRAWING
9	ARIZ.	189-A(20)IT	58	74	

189 SC 000

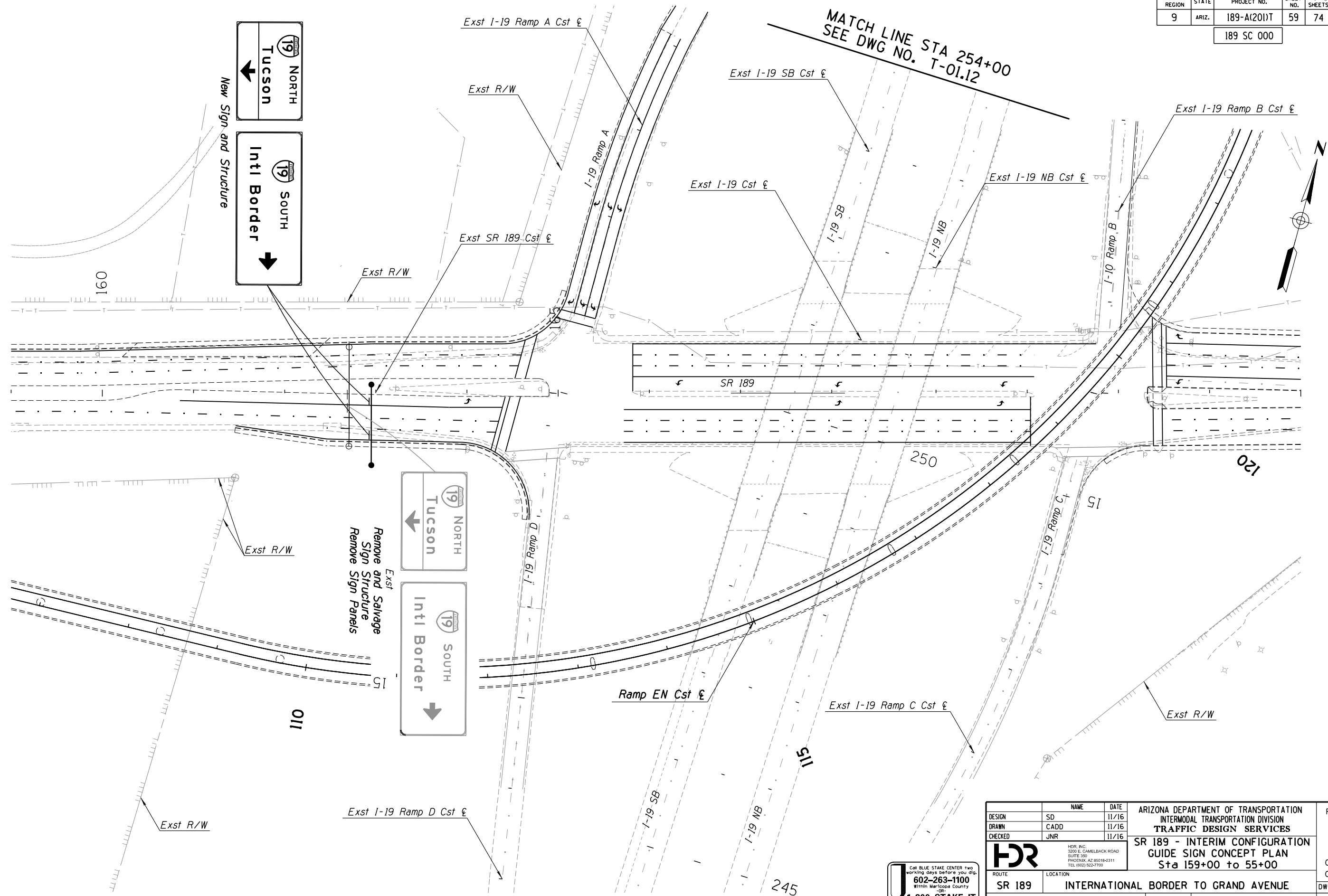


		NAME	DATE	ARIZONA DEPARTMENT OF TRANSPORTATION INTERMODAL TRANSPORTATION DIVISION TRAFFIC DESIGN SERVICES	PRELIMINARY <b>STAGE II</b> Review NOT FOR CONSTRUCTION OR RECORDING
DESIGN	SD		11/16		
DRAWN	CADD		11/16		
CHECKED	JNR		11/16		
		HDR, INC. 3200 E. CAMELBACK ROAD SUITE 100 PHOENIX, AZ 85018-2311 TEL: (602) 522-7700		SR 189 - INTERIM CONFIGURATION GUIDE SIGN CONCEPT PLAN Sta 145+00 to 159+00	
ROUTE		LOCATION			
SR 189		INTERNATIONAL BORDER TO GRAND AVENUE			DWG NO. T-01.09
TRACS NO. H8045 OIL				189-SC-000	___ OF ___

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(182-5548)

F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	RECORD DRAWING
9	ARIZ.	189-A(20)IT	59	74	

189 SC 000

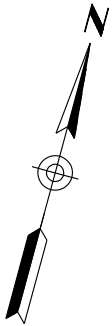
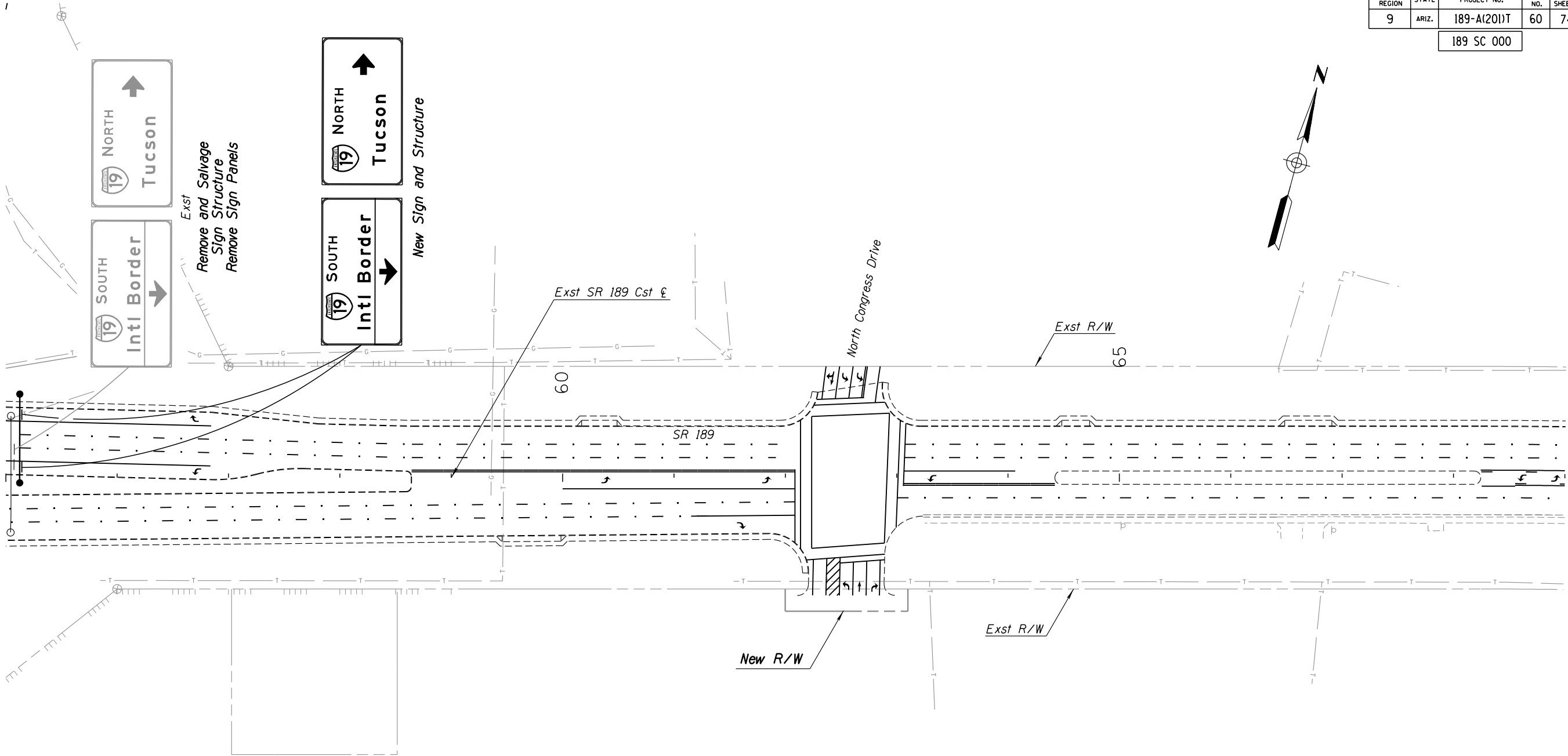



Call BLUE STAKE CENTER two working days before you dig.  
602-263-1100  
Within Maricopa County  
1-800-STAKE-IT (1782-5548)

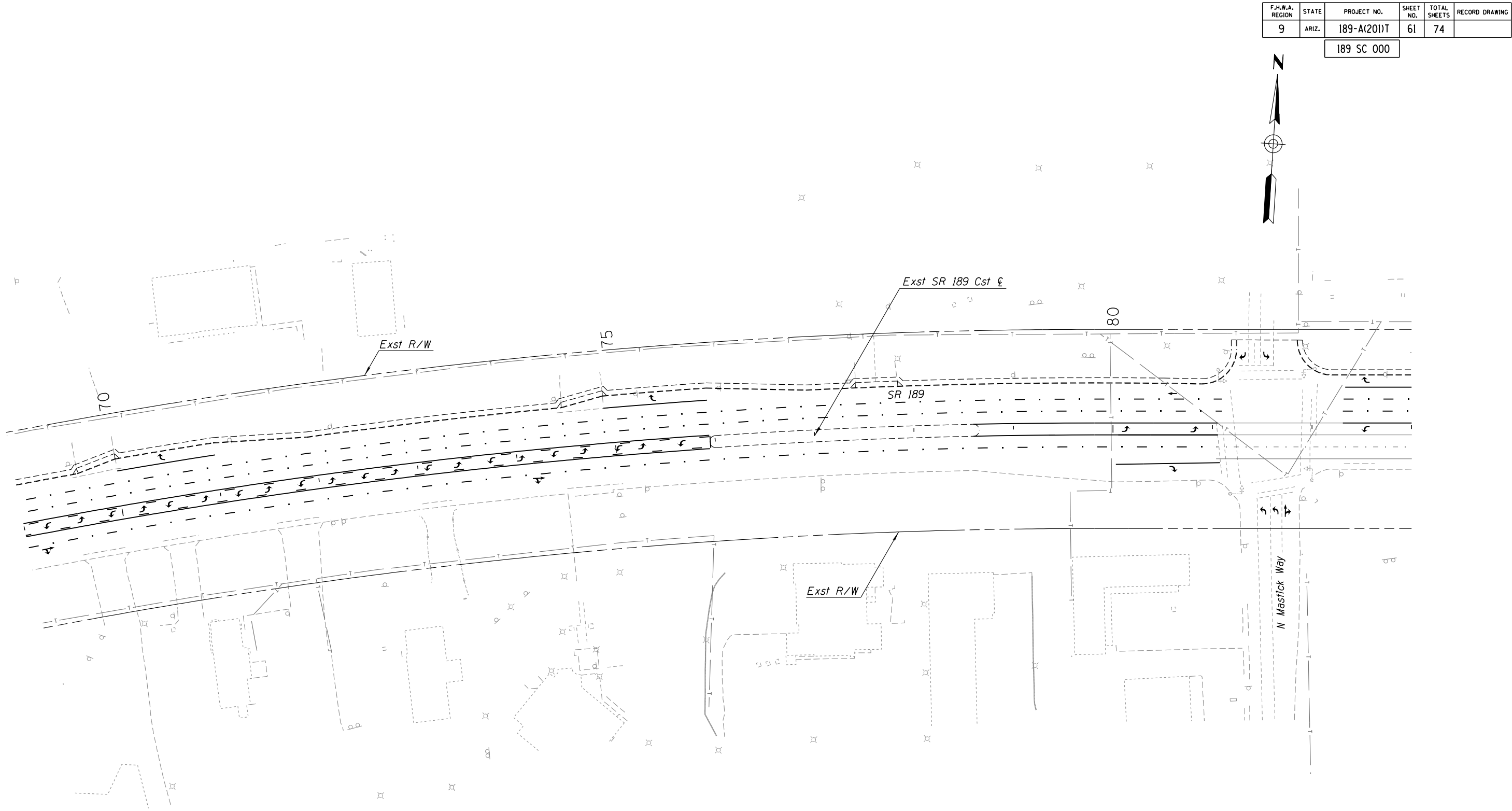
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DRAWN	CADD	DATE	11/16		
CHECKED	JNR	DATE	11/16		
<b>HDR</b> HDR, INC. 3200 E. CAMELBACK ROAD SUITE 100 PHOENIX, AZ 85018-2311 TEL: (602) 522-7700				SR 189 - INTERIM CONFIGURATION GUIDE SIGN CONCEPT PLAN Sta 159+00 to 55+00	
ROUTE		LOCATION		DWG NO. T-01.10	
SR 189		INTERNATIONAL BORDER TO GRAND AVENUE		OF	
TRACS NO. H8045 OIL				189-SC-000	

F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	RECORD DRAWING
9	ARIZ.	189-A(20)IT	60	74	

189 SC 000




		NAME	DATE	ARIZONA DEPARTMENT OF TRANSPORTATION INTERMODAL TRANSPORTATION DIVISION TRAFFIC DESIGN SERVICES	PRELIMINARY <b>STAGE II</b>  Review NOT FOR CONSTRUCTION OR RECORDING
DESIGN	SD		11/16		
DRAWN	CADD		11/16		
CHECKED	JNR		11/16		
 HDR, INC. 3200 E. CAMELBACK ROAD SUITE 300 PHOENIX, AZ 85018-2311 TEL (602) 922-7700				SR 189 - INTERIM CONFIGURATION GUIDE SIGN CONCEPT PLAN Sta 55+00 to 69+00	
ROUTE		LOCATION		DWG NO. T-01.11	
SR 189		INTERNATIONAL BORDER TO GRAND AVENUE			
TRACS NO. H8045 OIL			189-SC-000		___ OF ___



F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	RECORD DRAWING
9	ARIZ.	189-A(20)IT	61	74	
189 SC 000					

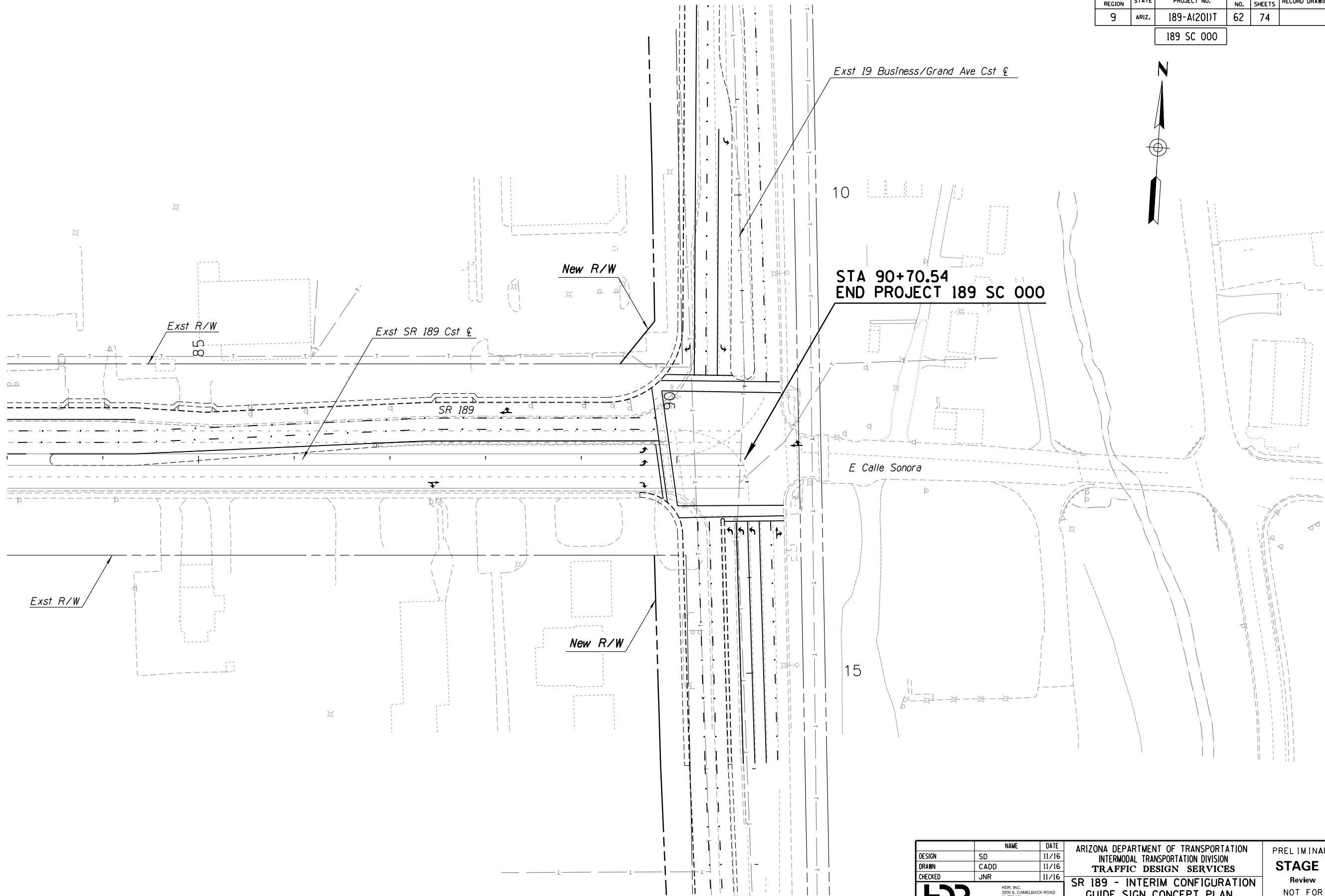


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CHECKED	JNR		11/16		
				SR 189 - INTERIM CONFIGURATION GUIDE SIGN CONCEPT PLAN Sta 69+00 to 83+00	
ROUTE		LOCATION		DWG NO. T-01.12	
SR 189		INTERNATIONAL BORDER TO GRAND AVENUE		OF	
TRACS NO. H8045 OIL				189-SC-000	




F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	RECORD DRAWING
9	ARIZ.	189-A(20)IT	62	74	

189 SC 000

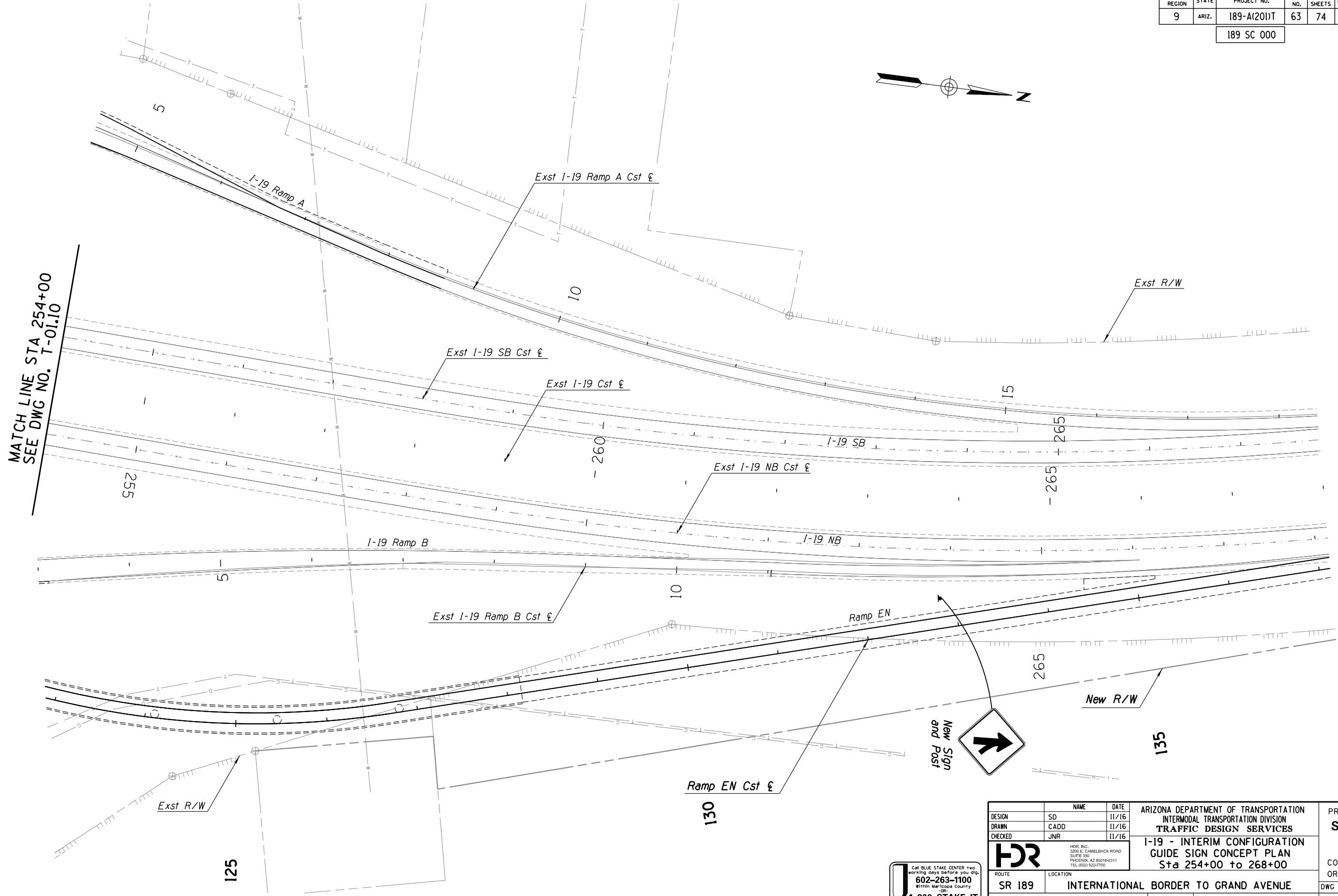


STA 90+70.54  
END PROJECT 189 SC 000


		NAME	DATE	ARIZONA DEPARTMENT OF TRANSPORTATION INTERMODAL TRANSPORTATION DIVISION TRAFFIC DESIGN SERVICES		PRELIMINARY <b>STAGE II</b> Review NOT FOR CONSTRUCTION OR RECORDING
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DRAWN		CADD	11/16			
CHECKED		JNR	11/16	SR 189 - INTERIM CONFIGURATION GUIDE SIGN CONCEPT PLAN Sta 83+00 to 90+70.54		CONSTRUCTION OR RECORDING
		HDR, INC. 3200 E. CAMELBACK ROAD SUITE 100 PHOENIX, AZ 85016-2311 TEL: (602) 522-7700				
ROUTE		LOCATION				DWG NO. T-01.13
SR 189		INTERNATIONAL BORDER TO GRAND AVENUE				
TRACS NO. H8045 OIL			189-SC-000			___ OF ___

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F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	RECORD DRAWING
9	ARIZ.	189-A(20)IT	63	74	
189 SC 000					



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1-800-STAKE-IT  
(182-5546)

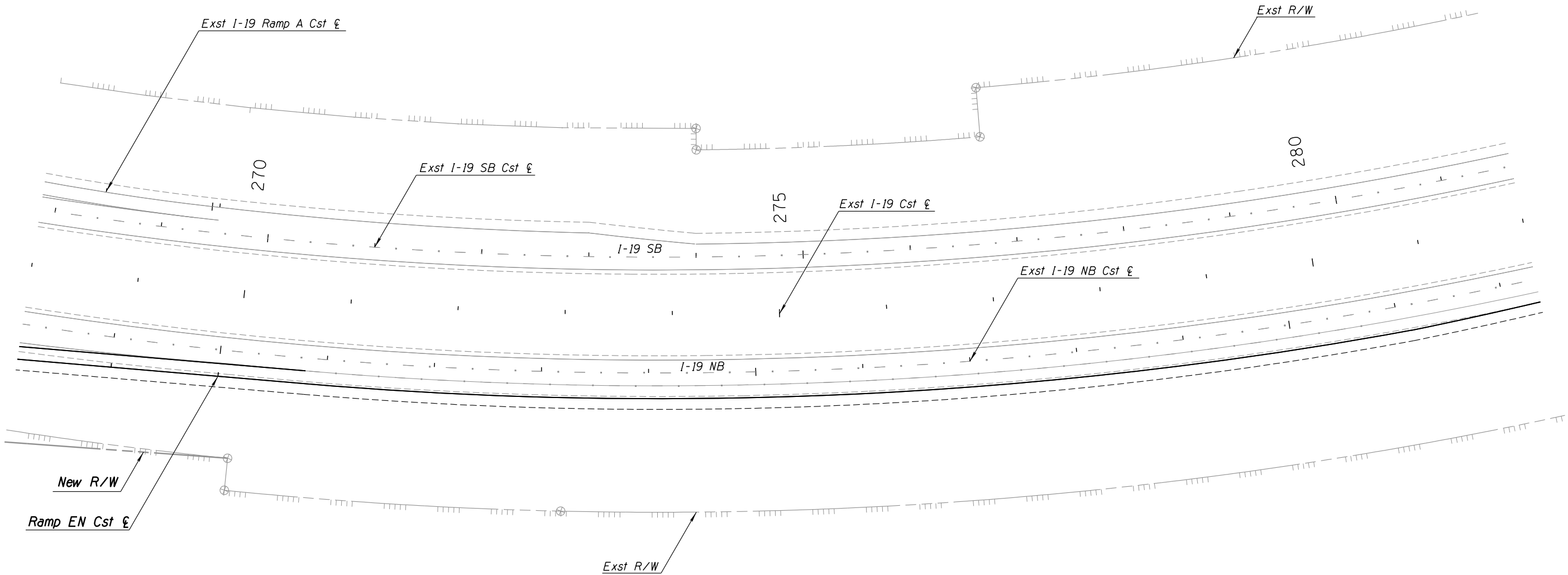
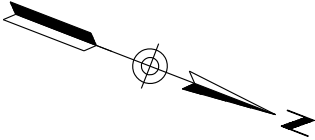
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CHECKED		JNR	11/16	I-19 - INTERIM CONFIGURATION GUIDE SIGN CONCEPT PLAN Sta 254+00 to 268+00		DWG NO. T-01.14
						
HDR, INC. 3200 E. CAMELBACK ROAD SUITE 300 PHOENIX, AZ 85018-2311 TEL. (602) 962-7700						
ROUTE		LOCATION		INTERNATIONAL BORDER TO GRAND AVENUE		
SR 189						
TRACS NO. H8045 OIL				189-SC-000		OF


FILE NAME: \\pwworking\phx\0486934\h8045\9s15.dgn PLOT DATE: Nov, 16, 2016 TIME: 10:25:44 AM PLOT SCALE: 1:100 PLOT BY: AHOFFMAN

SURVEY NO.	FINISHED PLANS	REVISIONS	DATE	LOCATION	DATE	LOCATION	REVISIONS	DATE	LOCATION

F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	RECORD DRAWING
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189 SC 000



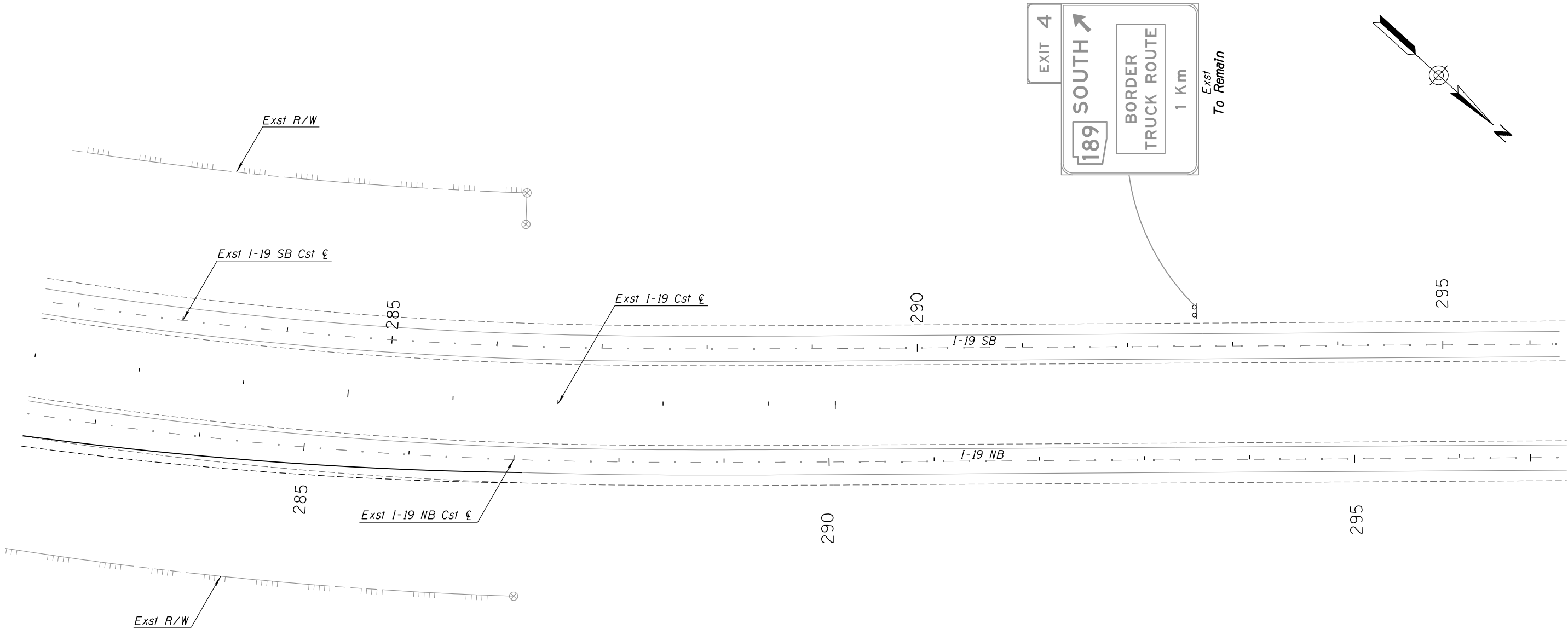
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ROUTE		LOCATION		INTERNATIONAL BORDER TO GRAND AVENUE		
SR 189						
TRACS NO. H8045 OIL				189-SC-000		___ <i>OF</i> ___


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SURVEY NO.		FINISHED PLANS		REVISIONS		LOCATION		DATE	


F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	RECORD DRAWING
9	ARIZ.	189-A(20)IT	65	74	

189 SC 000

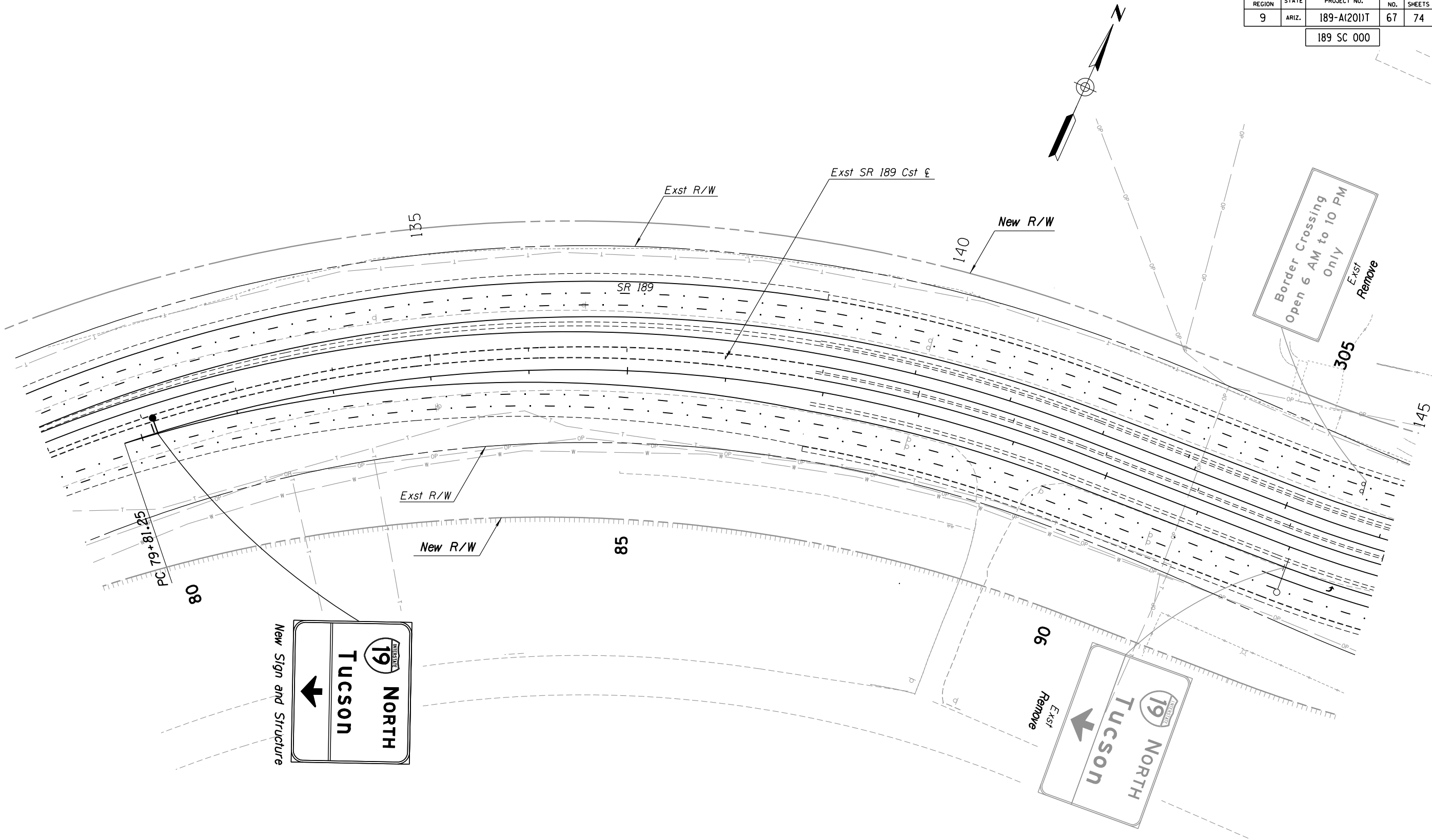


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CHECKED		JNR	11/16	I-19 INTERIM CONFIGURATION GUIDE SIGN CONCEPT PLAN Sta 282+00 to 295+00		DWG NO. T-01.16
		HDR, INC. 3200 E. CAMELBACK ROAD SUITE 300 PHOENIX, AZ 85016-2311 TEL: (602) 522-7700				
ROUTE		LOCATION				SR 189 INTERNATIONAL BORDER TO GRAND AVENUE
SR 189						
TRACS NO. H8045 OIL				189-SC-000		___ OF ___

189 SC 000

		NAME	DATE	ARIZONA DEPARTMENT OF TRANSPORTATION INTERMODAL TRANSPORTATION DIVISION TRAFFIC DESIGN SERVICES SR 189 - ULTIMATE CONFIGURATION GUIDE SIGN CONCEPT PLAN Sta 117+00 to 131+00	PRELIMINARY		
DESIGN		SD	11/16		 HDR, INC. 3200 E. CAMELBACK ROAD SUITE 520 PHOENIX, AZ 85018-2311 TEL. (602) 922-7700	STAGE II Review NOT FOR CONSTRUCTION OR RECORDING	
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CHECKED		JNR	11/16				
TRACS NO. H8045 OIL			189-SC-000		OF		






F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	RECORD DRAWING
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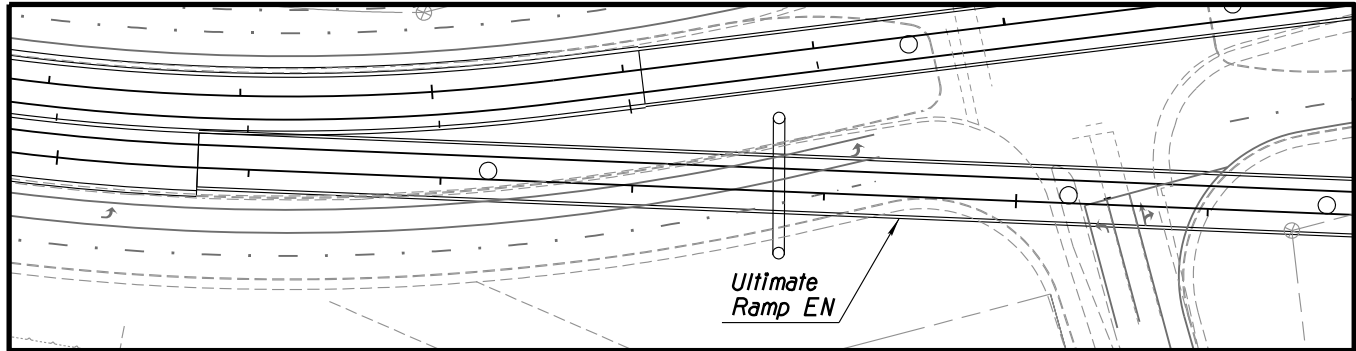
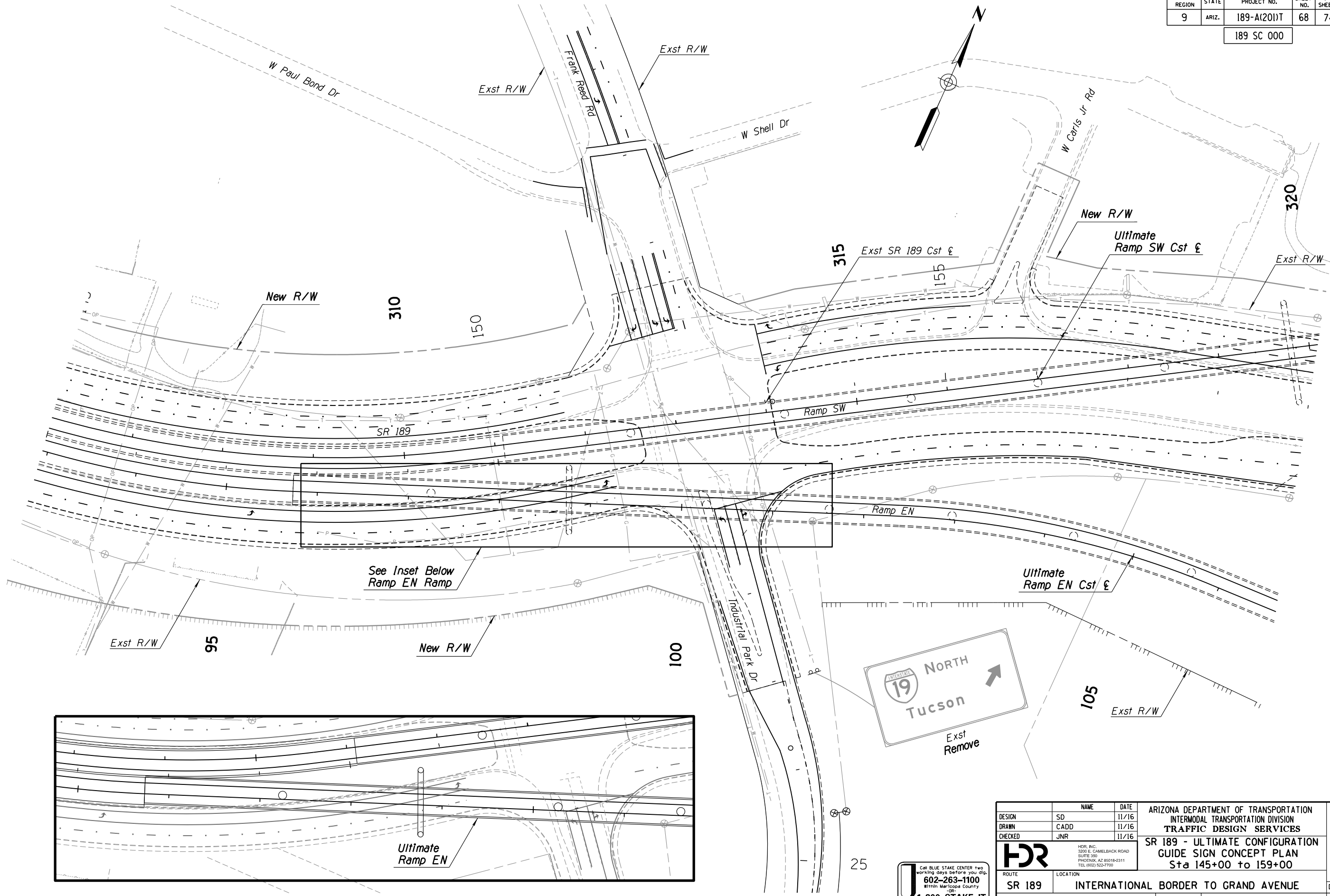
189 SC 000



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CHECKED		JNR		11/16					
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		ROUTE		LOCATION					
SR 189		INTERNATIONAL BORDER TO GRAND AVENUE							
TRACS NO. H8045 OIL				189-SC-000				___ OF ___	

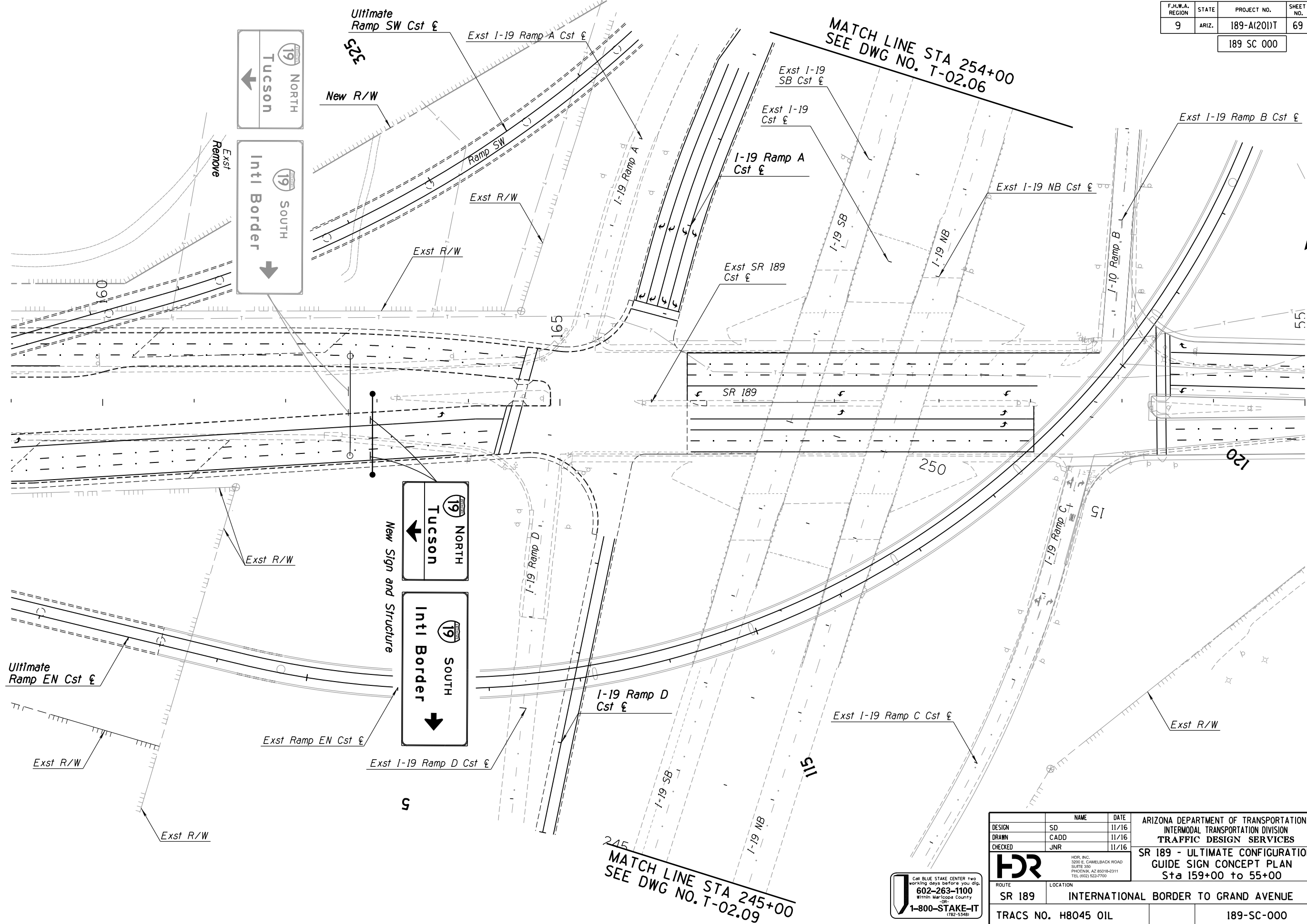
F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	RECORD DRAWING
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189 SC 000



DESIGN	NAME	DATE	ARIZONA DEPARTMENT OF TRANSPORTATION INTERMODAL TRANSPORTATION DIVISION TRAFFIC DESIGN SERVICES  SR 189 - ULTIMATE CONFIGURATION GUIDE SIGN CONCEPT PLAN Sta 145+00 to 159+00			PRELIMINARY <b>STAGE II</b> Review NOT FOR CONSTRUCTION OR RECORDING DWG NO. T-02.03
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CHECKED	CADD	11/16				
	JNR	11/16				
ROUTE 189			LOCATION INTERNATIONAL BORDER TO GRAND AVENUE			
TRACS NO. H8045 OIL			189-SC-000			OF

F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	RECORD DRAWING
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189 SC 000					

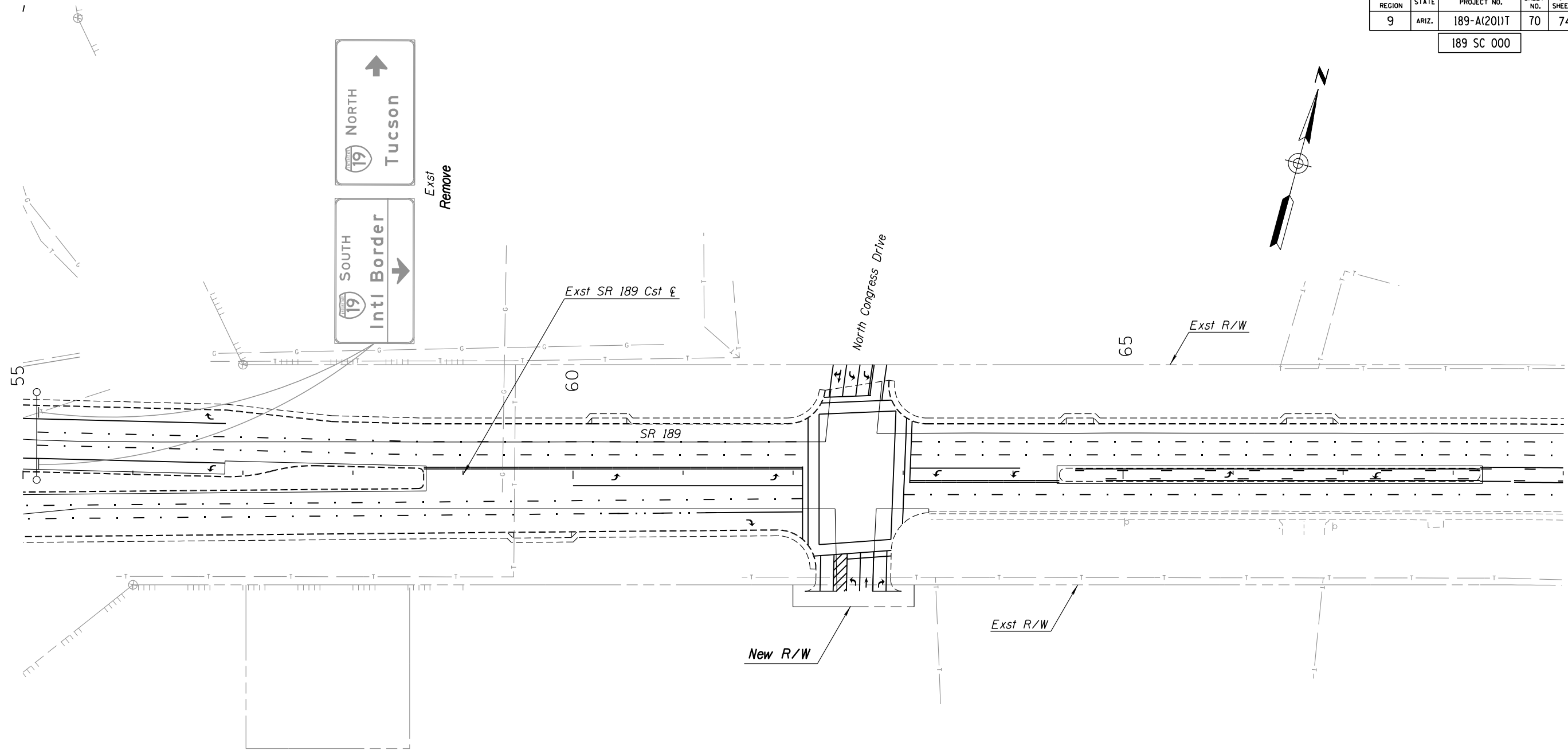


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DRAWN	CADD		11/16		
CHECKED	JNR		11/16		
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ROUTE		LOCATION		DWG NO. T-02.04	
SR 189		INTERNATIONAL BORDER TO GRAND AVENUE			
TRACS NO. H8045 OIL			189-SC-000		___ OF ___




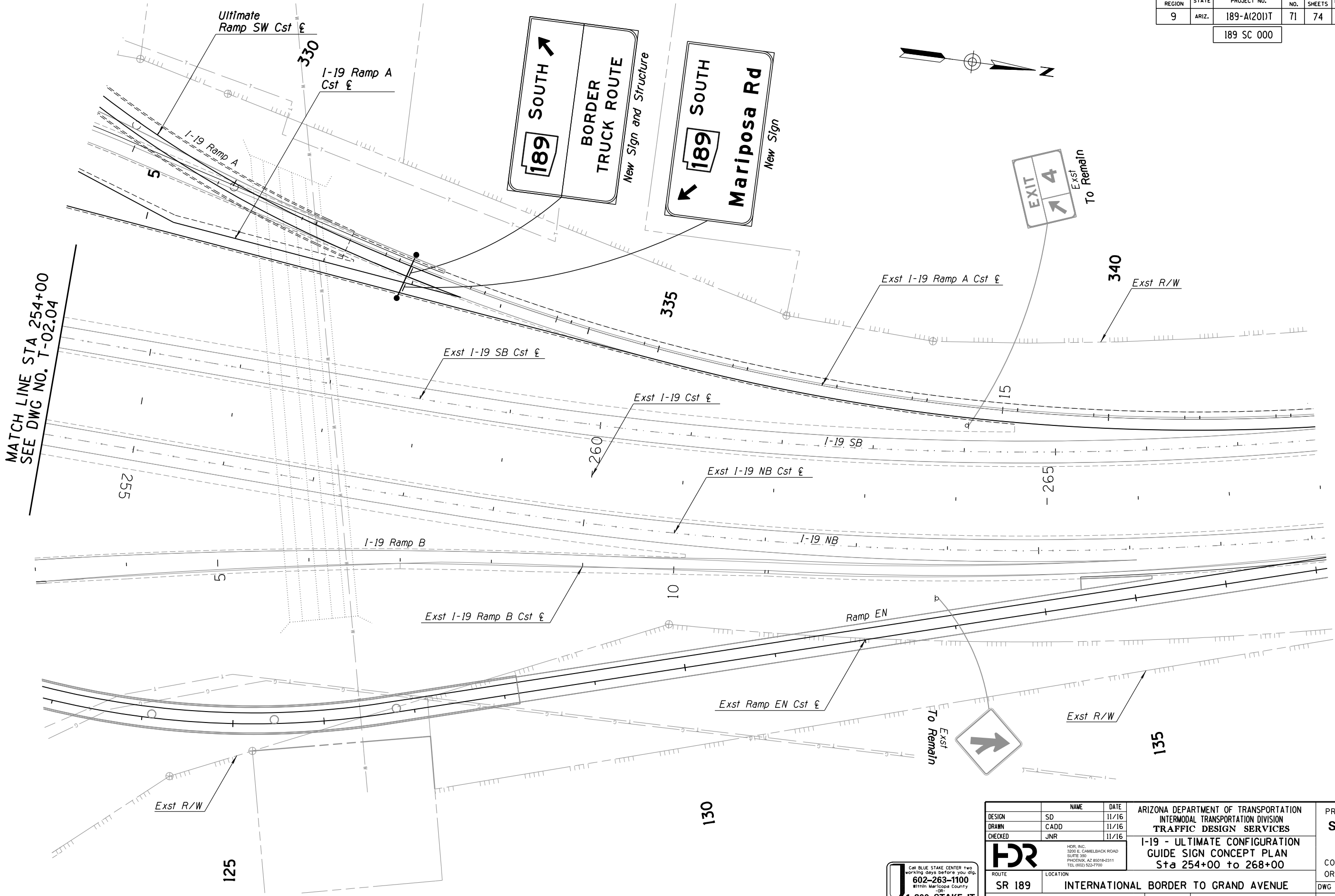
F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	RECORD DRAWING
9	ARIZ.	189-A(201)T	70	74	

189 SC 000



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		NAME	DATE	ARIZONA DEPARTMENT OF TRANSPORTATION INTERMODAL TRANSPORTATION DIVISION TRAFFIC DESIGN SERVICES  SR 189 - ULTIMATE CONFIGURATION GUIDE SIGN CONCEPT PLAN Sta 55+00 to 69+00	PRELIMINARY	
DESIGN	SD	11/16	 <div>HDR, INC. 3200 E. CAMELBACK ROAD SUITE 350 PHOENIX, AZ 85018-2311 TEL (602) 962-7700</div>		<b>STAGE II</b> Review NOT FOR CONSTRUCTION OR RECORDING	
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CHECKED	JNR	11/16				
TRACS NO. H8045 OIL		189-SC-000			___ OF ___	



F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	RECORD DRAWING
9	ARIZ.	189-A(20)IT	71	74	
189 SC 000					

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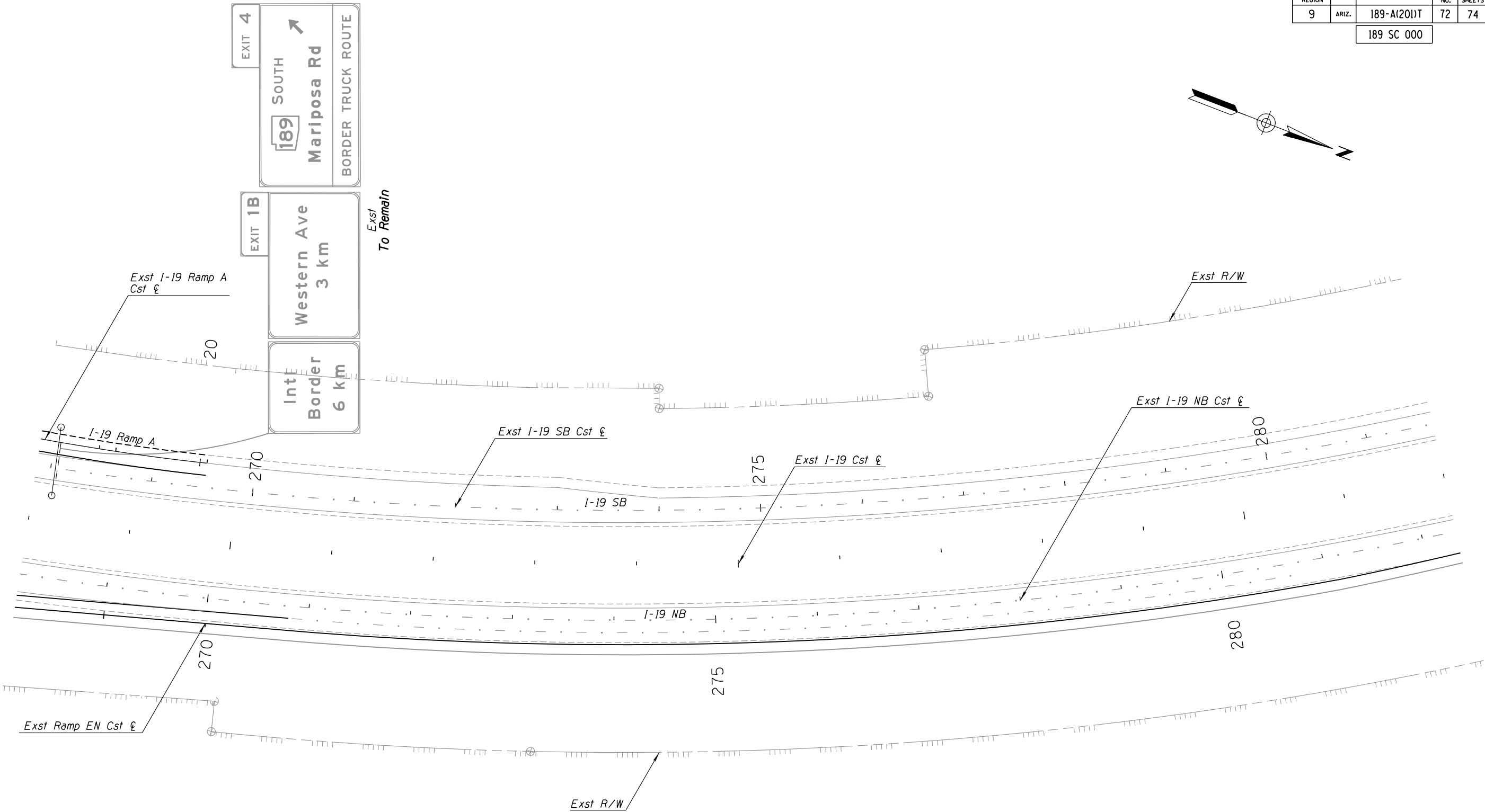
(782-5548)


DESIGN	SD	NAME	DATE	ARIZONA DEPARTMENT OF TRANSPORTATION INTERMODAL TRANSPORTATION DIVISION TRAFFIC DESIGN SERVICES	PRELIMINARY <b>STAGE II</b> Review NOT FOR CONSTRUCTION OR RECORDING
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CHECKED	JNR		11/16		
<b>HDR</b> HDR, INC. 3200 E. CAMELBACK ROAD SUITE 300 PHOENIX, AZ 85018-2311 TEL: (602) 522-7700				I-19 - ULTIMATE CONFIGURATION GUIDE SIGN CONCEPT PLAN Sta 254+00 to 268+00	
ROUTE		LOCATION		DWG NO. T-02.06	
SR 189		INTERNATIONAL BORDER TO GRAND AVENUE			
TRACS NO. H8045 OIL				189-SC-000	
				OF	



F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	RECORD DRAWING
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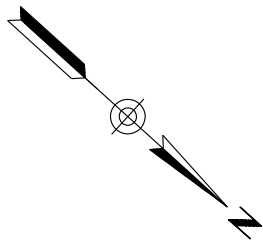
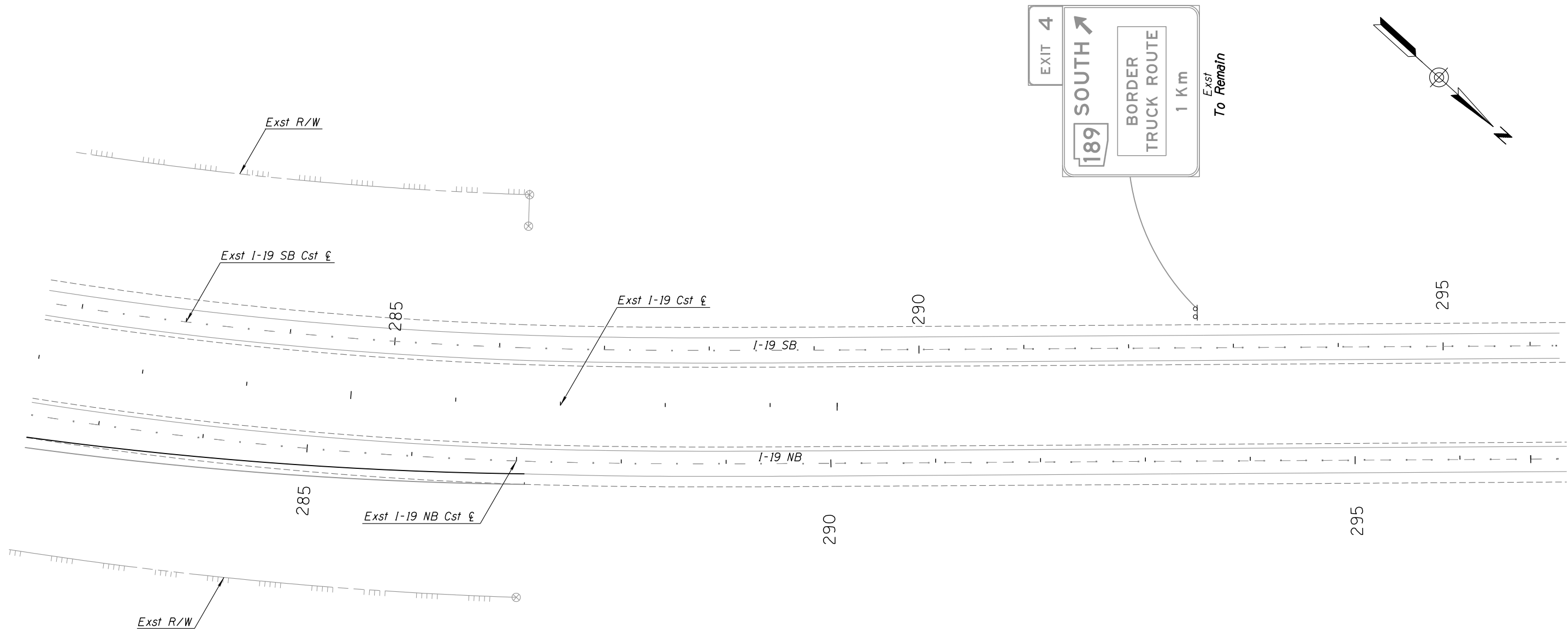
189 SC 000




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DRAWN		CADD		11/16					
CHECKED		JNR		11/16					
		HDR, INC. 3200 E. CAMELBACK ROAD SUITE 350 PHOENIX, AZ 85018-2311 TEL (602) 922-7700				I-19 - ULTIMATE CONFIGURATION GUIDE SIGN CONCEPT PLAN Sta 268+00 to 282+00			
		ROUTE		LOCATION					
SR 189		INTERNATIONAL BORDER TO GRAND AVENUE						Review NOT FOR CONSTRUCTION OR RECORDING	
								DWG NO. T-02.07	
TRACS NO. H8045 OIL				189-SC-000				___ OF ___	

F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	RECORD DRAWING
9	ARIZ.	189-A(20)1T	73	74	

189 SC 000



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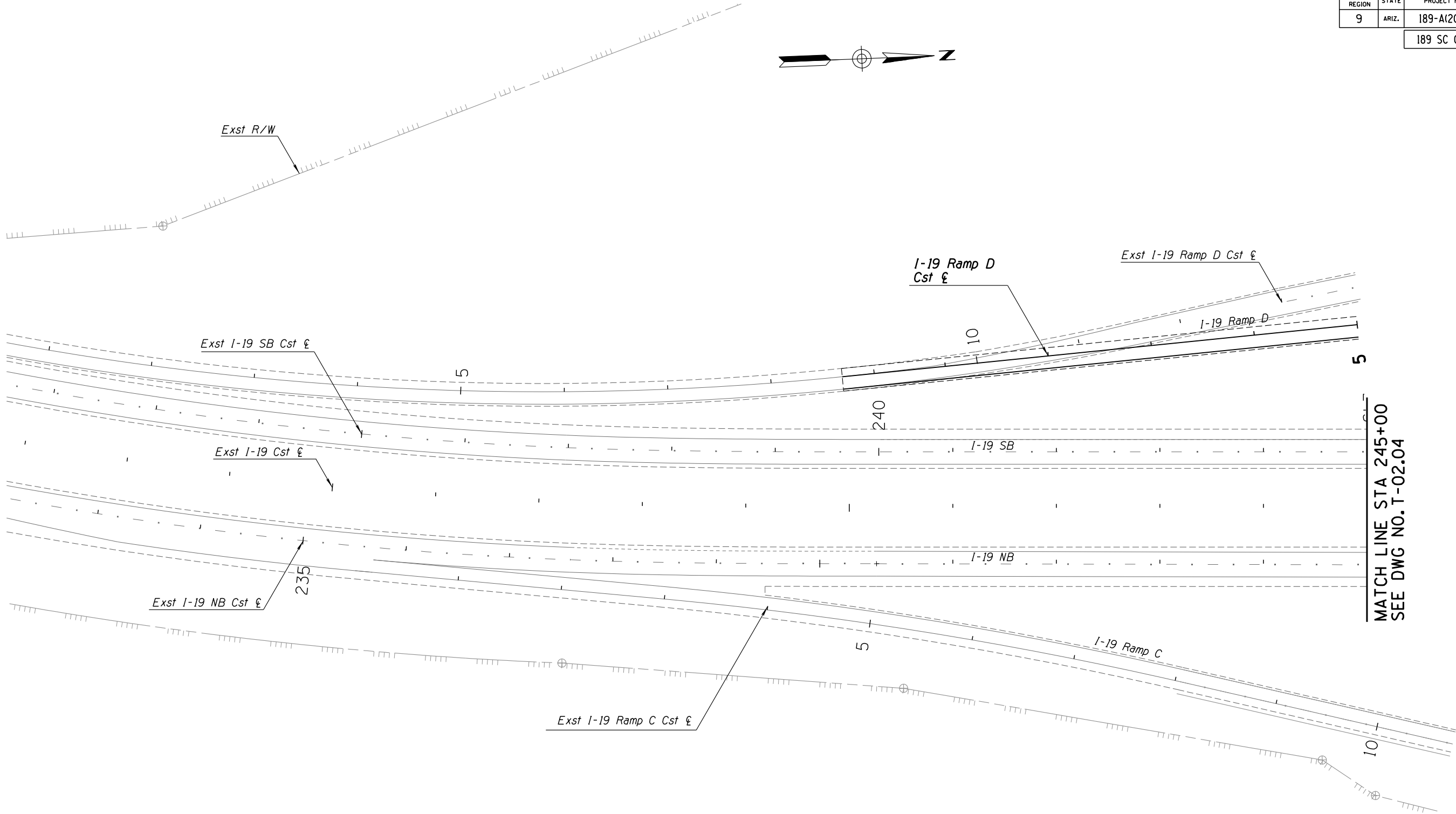
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CHECKED	JNR	11/16		
 HDR, INC. 3200 E. CAMELBACK ROAD SUITE 520 PHOENIX, AZ 85018-2311 TEL. (602) 952-7700				
ROUTE		LOCATION		
SR 189		INTERNATIONAL BORDER TO GRAND AVENUE		DWG NO. T-02.08
TRACS NO. H8045 OIL			189-SC-000	___ OF ___

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SURVEY NO.	FINISHED PLANS	REVISIONS	LOCATION	DATE


F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	RECORD DRAWING
9	ARIZ.	189-A(20)IT	74	74	

189 SC 000



MATCH LINE STA 245+00  
SEE DWG NO. T-02.04



		NAME		DATE		ARIZONA DEPARTMENT OF TRANSPORTATION INTERMODAL TRANSPORTATION DIVISION TRAFFIC DESIGN SERVICES		PRELIMINARY		
DESIGN	SD		11/16		I-19 - ULTIMATE CONFIGURATION GUIDE SIGN CONCEPT PLAN Sta 232+00 to 245+00			STAGE II		
DRAWN	CADD		11/16					Review		
CHECKED	JNR		11/16					NOT FOR CONSTRUCTION OR RECORDING		
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ROUTE		LOCATION								
SR 189		INTERNATIONAL BORDER TO GRAND AVENUE								
TRACS NO. H8045 OIL				189-SC-000				___ OF ___		

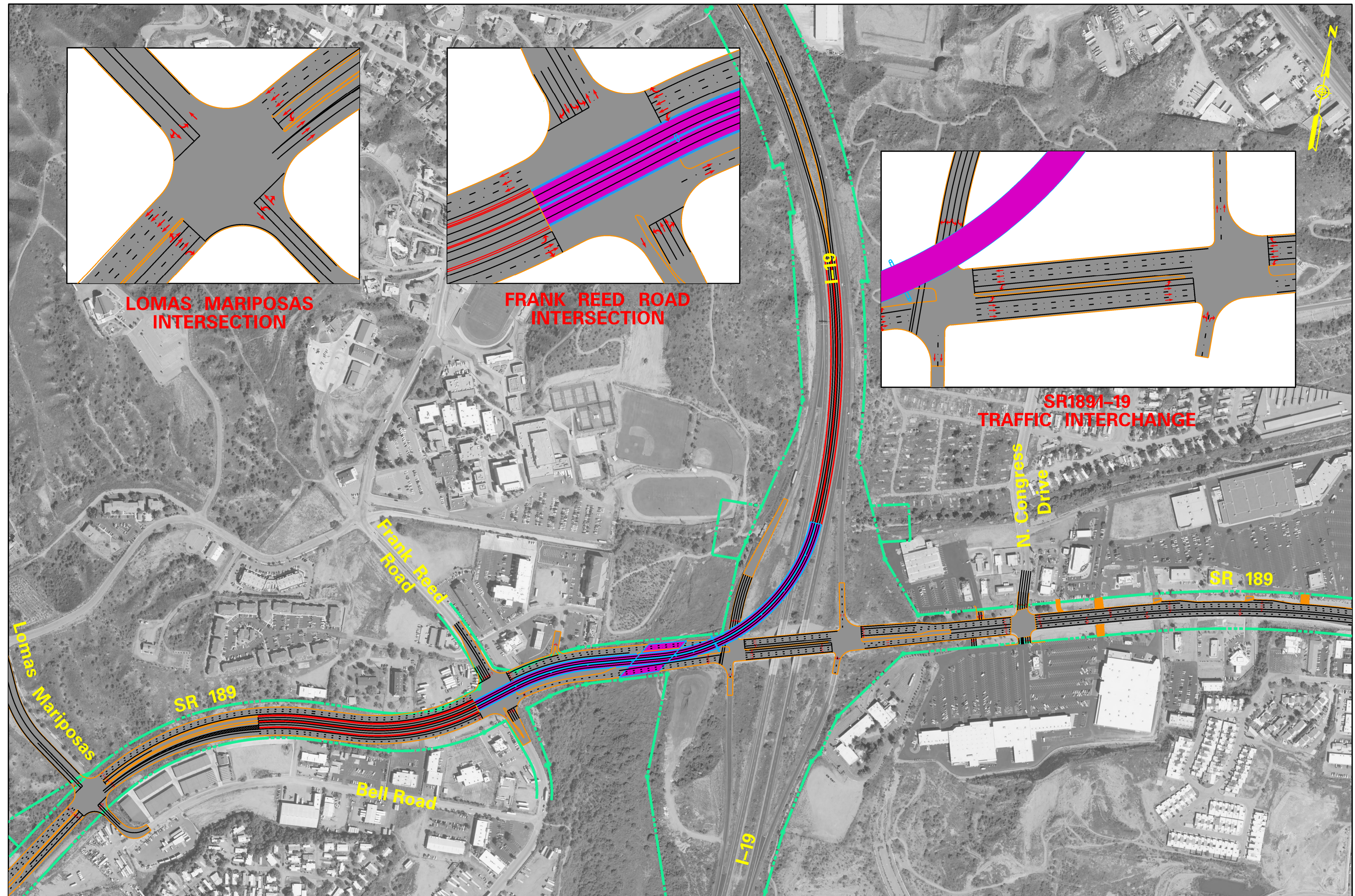
**Appendix B. Option D Mariposa Traffic Interchange**

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# SR 189 MARIPOSA TI – OPTION D INSIDE FLYOVER WITH GRADE SEPARATION AT FRANK REED ROAD



Information presented is preliminary and subject to change throughout the study process  
Aerial Date: January 2013  
Revision Date: April 22, 2015



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Appendix C. Summary of Comments

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**REVIEW COMMENTS AND RESPONSES**  
**SR 189, International Border to Grand Avenue**  
**TRACS No. H8045 01L**  
**PRE-INITIAL DESIGN CONCEPT REPORT**



Overall Number	Reviewer	Reviewer Number	Sheet No.	Comment	Response By	Initial Disp.	Response	Final Disp.
<b>ADOT Roadway Support - Glenn Gaelick</b>								
1	G. Gaelick	1	1	1st paragraph, 2nd sentence - "change of access report" should be "change of access request".		A	Will revise.	
2	G. Gaelick	2	24-28	There appears to be a significant improvement between the base and interim conditions based on travel times and LOS. There seems to be a negligible measure of benefit between interim and ultimate configuration LOS for each of the intersections listed. Could this justify eliminating the S-W Ramp and a widened SR189 median between I-19 & Loma Mariposa Road or would justification for constructing the S-W ramp be found elsewhere?		B/C	Justification to add Ramp SW was to support the resolution passed by the City and County to provide a multi-directional flyover ramp which is grade separated over FRR. This justification has been documented in the TI screening report and EA document. DCR will be revised to further expand on the justification of Ramp SW.	
3	G. Gaelick	3	25-28	Benefit of E-N Ramp ultimate configuration vs. interim configuration is difficult to ascertain. It appears that the elimination of E-N traffic crossing Frank Reed at grade is the primary difference and the issue appears to be whether the elimination of this at-grade crossing is worth the added structure cost.		B/C	Justification to add Ramp SW was to support the resolution passed by the City and County to provide a multi-directional flyover ramp which is grade separated over FRR. This justification has been documented in the TI screening report and EA document. DCR will be revised to further expand on the justification of Ramp SW.	
4	G. Gaelick	4	40-41	Under Area 2 header, 3rd paragraph – Figure 5 is nowhere to be found. Perhaps the entire sentence could be deleted without any harming the document.		A	Will revise DCR to reference the correct figure.	
5	G. Gaelick	5	General	Should an ADA compliance and Feasibility report be part of the DCR scope and should the construction scope include improvements pursuant to ADOT's ADA implementation plan?		B/C	Will evaluate.	





**REVIEW COMMENTS AND RESPONSES**  
**SR 189, International Border to Grand Avenue**  
**TRACS No. H8045 01L**  
**PRE-INITIAL DESIGN CONCEPT REPORT**



Overall Number	Reviewer	Reviewer Number	Sheet No.	Comment	Response By	Initial Disp.	Response	Final Disp.
6	G. Gaelick	6	6/54	Based on a presumed northeast oriented perspective and a southwest direction of travel for the SW ramp, it seems like the depiction of lane and shoulder width callouts for the SW ramp along with the walls and barrier should be mirrored vertically about the centerline. This calls into question the location of the SW centerline on plan. Please check.		A	The typical section for Ramp SW is shown incorrectly. The lane configuration and the PGL will needed to be mirrored to show the correct layout. Will revise accordingly.	
7	G. Gaelick	7	8-15/54	The hollow oval icons presumed to be for existing centerline curve data seem out of place. Is Designer's intent to eventually utilize these cells for existing centerline geometry? Please clarify.		A	Yes, The hollow ovals represent the existing geometry data which will be populated in the future 30% level submittal.	
8	G. Gaelick	8	21/54	An end section for the 54" pipe extension and one for the new 24" pipe appear to be misplaced under the proposed SE leg of Loma Mariposa. Please check.		A	The end sections will be revised to match the proposed roadway.	
9	G. Gaelick	9	22/54	There is a callout for SR 189 EB Cst CL that appears to be pointing to the wrong centerline. Please check.		A	Will revise the callout to say SR 189 Ramp EN Cst CL.	
10	G. Gaelick	10	23/54	a) Graphically, the easternmost SR 189 bullnose seems to have a square corner. It seems like it should be similar to the one on the other side of Frank Reed Rd.		A	Will evaluate and revise accordingly. Bullnose configuration was determined by the WB-67 turning templates.	
				b) Please check with ADOT Bridge regarding the proposed piers shown in the SR189 bullnose areas on each side of Frank Reed Rd. and their potential disposition to impact.		A	Will coordinate with ADOT bridge.	



**REVIEW COMMENTS AND RESPONSES**  
**SR 189, International Border to Grand Avenue**  
**TRACS No. H8045 01L**  
**PRE-INITIAL DESIGN CONCEPT REPORT**



Overall Number	Reviewer	Reviewer Number	Sheet No.	Comment	Response By	Initial Disp.	Response	Final Disp.
				c) Has a WB67 template been run through this intersection to ascertain any conflicts with turn movements?		A	Yes, we have ran WB67 templates through the intersection and can provide if needed. Additional template runs will be conducted as the design progresses.	
11	G. Gaelick	11	24/54	West of the Exst I-19 Ramps A & B intersection with SR189, please check the proximity of the median straddle bent column to the raised median curb. Same for the median pier immediately west of the straddle bent.		A	Will evaluate.	
12	G. Gaelick	12	28/54	The PCC callout for SW Ramp Sta 342+79.87 would benefit from relocation.		A	Will revise graphically to clarify note.	
13	G. Gaelick	13	33/54	There is a catch basin shown ~ Sta 23+00 Lt along the south leg of Industrial Drive that seems to be misplaced.		A	Will adjust catch basin to match new roadway edges.	
14	G. Gaelick	14	34/54	Reason for SR189 EB & WB vertical control beginning at stations different from horizontal control in plan sheet 21/54 is unclear. Please clarify.		A	Horizontal sheets show beginning station at 122+00. Profile sheets show 124+00. Will revise to ensure horizontal and vertical control is consistent.	
15	G. Gaelick	15	37/54	Reason for SR189 EB & WB vertical control ending at stations different from horizontal control in plan sheet 24/54 is unclear. Please clarify.		A	Will correct horizontal and vertical stations to be consistent.	
16	G. Gaelick	16	47/54	a) Does the Lt. turn movement from Ramp SW onto the proposed east leg of Loma Mariposa that connects to Bell Road exclude Lt turn movement for SB SR189 traffic onto Bell Road?		D	Yes it does. Vehicles traveling SB on 189 will have the opportunity to access Bell Road from the Frank Reed Road intersection. Current traffic model shows that LOS is at acceptable levels.	
				b) It seems that the LT most SB through lane on SR 189 goes into a Rt turn only lane approaching the SB Rt in, Rt out only driveway Sta ~118+00 Lt. Is this the intent?		D	Yes, currently this is the intent. The outside SB through lane would need to merge to the left in order to continue south beyond the Rt-in/Rt-out driveway. Current traffic model	



**REVIEW COMMENTS AND RESPONSES**  
**SR 189, International Border to Grand Avenue**  
**TRACS No. H8045 01L**  
**PRE-INITIAL DESIGN CONCEPT REPORT**



Overall Number	Reviewer	Reviewer Number	Sheet No.	Comment	Response By	Initial Disp.	Response	Final Disp.
17	G. Gaelick	17	47-48/54	<p>There may be value in merging the SW Ramp through traffic lane with SB 189 traffic prior to the Loma Mariposa intersection which could serve to:</p> <p>a) Decrease raised median area &amp; R/W requirements on west side of SR189.</p> <p>b) Decrease the probability of Lt turn movements from EB Loma Mariposa going wrong direction on SW Ramp.</p> <p>c) Allow Lt turns from SB 189 to EB Loma Mariposa.</p> <p>Doing so might warrant construction of the S-W Ramp touchdown south of Frank Reed Rd. in the Interim Phase.</p>		B/C	<p>This was considered at one point but eliminated due to the delay and merging associated with the mix of vehicles approaching the intersection. Current traffic model shows that LOS is at acceptable levels.</p>	



**REVIEW COMMENTS AND RESPONSES**  
**SR 189, International Border to Grand Avenue**  
**TRACS No. H8045 01L**  
**PRE-INITIAL DESIGN CONCEPT REPORT**



Overall Number	Reviewer	Reviewer Number	Sheet No.	Comment	Response By	Initial Disp.	Response	Final Disp.
<b>ADOT Structures - Sherly Paul</b>								
18	S. Paul	1	44	In Section 4.12 Structures, the height of the F-Shape Barrier should be 44-inch instead of 42-inch. Please correct for Ramp EN-Interim (page 44), Ramp EN –Ultimate (page 45) and for Ramp SW (page 45).		A		
19	S. Paul	2	45	Is Ramp South-to-West (SW)-Interim? Page 35, Figure 4.1 shows only Ramp EN for Interim Condition. Page 36, Figure 4.2 shows as Ramp SW for Ultimate Condition. Please verify		D	Ramp SW is Ultimate Condition only.	
<b>ADOT MPD - Carlos Lopez</b>								
1	C. Lopez	1	page 1	<p>under this section:</p> <p>flip the order of the paragraphs:</p> <p>1) explain that based on stakeholder input and technical analysis the recommendation is the ultimate plan. Explain total cost and the benefits of the plan.</p> <p>Then follow that up with the (first) paragraph related to the programmed funding and funding shortfalls.</p> <p>Lastly, our current funding is \$64M for construction and \$4M for design. We need to have an interim condition that fits that \$68M budget. Right now we are just over that figure.</p>		A/C	Will revise DCR text to flip the order of the paragraphs. The current estimate is \$62.9 million for construction and design. Adding the ICAP and the ROW estimate is what pushed the estimate over \$68 million. Coordination with ADOT ROW is ongoing and HDR will revise the estimate to include the revised ROW estimate.	

**REVIEW COMMENTS AND RESPONSES**  
**SR 189, International Border to Grand Avenue**  
**TRACS No. H8045 01L**  
**PRE-INITIAL DESIGN CONCEPT REPORT**

Overall Number	Reviewer	Reviewer Number	Sheet No.	Comment	Response By	Initial Disp.	Response	Final Disp.
2	C. Lopez	2	page 1	delete this section:  The Alternatives development and screening section (above) talks about the corridor management alternative; now we need to explain the study process that led to the split ramp concept.		A	Will revise DCR to include a description of what led to the split lane concept. This discussion will be further documented in Section 3.0 (Evaluation of Alternatives)	
3	C. Lopez	3	page 2	revise to study area		A	Will revise.	
4	C. Lopez	4	page 2	update; it is now over 300k		A	Will revise.	
5	C. Lopez	5	page 2	This project opened in 2014? verify text to explain it is now open		A	POE expansion is completed and we will revise the DCR text accordingly.	
6	C. Lopez	6	page 6	based on the minimum of 200' ROW near SR 189/Frank Reed Rd; can we reconfigure design to stay within existing ROW?		B/C	We could evaluate eliminating or reducing the ROW impacts by re-aligning SR 189 to match the existing ROW geometry. This could potentially require reduced design speeds in order to achieve the tighter radius required.	
7	C. Lopez	7	page 12	Include language of the Feb 2015 counts. How do they relate to the 2011 existing conditions?		A	Will add text to include the results of the Feb 2015 counts.	
8	C. Lopez	8	page 23	fix		A	Will correct table headers.	
9	C. Lopez	9	page 24	In this table we show the interim/ultimate option but we have not presented what those look like.  Let's make sure that if we show interim and ultimate references we provide the reader a graphic, explanation or reference of what they look like.		A	We can revise the DCR to include figures of the interim/ultimate condition prior to this section. The Interim and Ultimate figures will be placed in the Executive Summary to assist the reader in distinguishing between the two build options.	
10	C. Lopez	10	page 28	for the intersections with LOS E or F what can be done to improve those? If our design concept cannot fix those can we document what the main issues are?		A	We can clarify in the DCR to document what those main issues are. We will also review the TOAR to make sure both documents are consistent.	





**REVIEW COMMENTS AND RESPONSES**  
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Overall Number	Reviewer	Reviewer Number	Sheet No.	Comment	Response By	Initial Disp.	Response	Final Disp.
11	C. Lopez	11	page 29	general comment;  This chapter needs to be consistent with the EA chapter - Alternatives. Once you revise the EA chapter; this section should follow it closely.		A	Agree. Will coordinate with the EA chapter.	
12	C. Lopez	12	page 29	delete or move to another place that discusses stakeholder outreach and/or programming (funding).		A	Acknowledged. We will place the text in the appropriate section.	
13	C. Lopez	13	page 29	reshuffle sections 3.1 to section 3.4  I would like to show the (stage 1 or section 3.2) corridor alternatives first. Follow that with the evaluation criteria, show the matrix and ratings. Lastly, show recommended corridor.  Next, jump to the (stage 2) TI alternatives.. show the 6 options, followed by the (stage 2) evaluation criteria. Show the matrix/ratings to identify the top two options and finally show how/why we ended with a hybrid (best of option A and D) to develop the ultimate plan.		A	Will revise according to the preferred order.	
14	C. Lopez	14	page 31	use the 3D graphics that you have for the six TI options.		A	We will include those 3D graphics into the report.	
15	C. Lopez	15	page 36	add; existing SB exit at SR189 is widened		A	Will revise to add.	
16	C. Lopez	16	page 36	show/reference to the justification; why do we need this signalized		B	Will coordinate with traffic group to show proper documentation for this level of design.	

**REVIEW COMMENTS AND RESPONSES**  
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Overall Number	Reviewer	Reviewer Number	Sheet No.	Comment	Response By	Initial Disp.	Response	Final Disp.
17	C. Lopez	17	page 36	add more information to this:  break out SR 189 corridor improvements and TI improvements; show more graphics; use the 3D graphics if applicable; similarly, for the recommended improvements add why we are recommending those; whether it is LOS, purpose and need etc..		A	Will expand on this section in the DCR. The SR189 corridor is broken out into Section 4.2 and I-19 TI is discussed in Section 4.3.	
18	C. Lopez	18	page 36	similar to comments on interim:  add more explanation; add more graphics on the recommended improvements; use 3D graphics		A	Will expand on this section in the DCR.	
19	C. Lopez	19	page 37	General comment on all intersections:  what map do we use to show intersection locations?  when we show an improvement; add sentence explaining the purpose		A	The DCR currently does not have a map that shows all of the intersection improvement locations graphically but the DCR plans can give the reader a detailed look at the proposed improvements. Will expand on the DCR text to explain the purpose of the intersection improvement.	
20	C. Lopez	20	page 38	Revise:  Explain Option D was preferred by stakeholders b/c it provided grade separation at FRR and provided multidirectional ramps. Based on our technical analysis and financial considerations we took the top two options A and D to address the stakeholder input in the ultimate plan. The ultimate plan includes the grade separation and multi directional ramps		A	Will revise.	



**REVIEW COMMENTS AND RESPONSES**  
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Overall Number	Reviewer	Reviewer Number	Sheet No.	Comment	Response By	Initial Disp.	Response	Final Disp.
21	C. Lopez	21	page 47	our current budget is \$64M (construction) and \$4M (design); ADOT ROW group will provide/verify ROW costs by mid April. Our goal is to have an interim project within the budget. This cost of \$69.4M is above what we have.		B/C	Our estimate shows \$57.4 million for construction and \$3.5 million for design.  The \$69.4 million he is referring to is the total cost including below the line items which includes ROW as well. Need clarification if the current total budget of \$68 million includes ROW acquisition.	

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Appendix D. Order of Magnitude Project Cost Estimates

ARIZONA DEPARTMENT OF TRANSPORTATION					
Estimate No. 5					
CONSTRUCTION COST ESTIMATE SUMMARY					
ROUTE: SR 189		PROJECT DESCRIPTION: Construct Roadway			
SEGMENT: Interim Condition		ESTIMATE SUMMARY LEVEL: Level 0 (15% Design)			
LENGTH: 3 MILES		TRACS NO.: 189 SC 000 H8045 01L		DATE: May 2016	
ITEM	MAJOR ITEM DESCRIPTION	UNIT	QUANTITY	UNIT COST	TOTAL COST
200	EARTHWORK	L.SUM	1	719,800	719,800
	CLEARING & REMOVALS	CU.YD.	271,004	10.30	2,710,040
	ROADWAY EXCAVATION	CU.YD.	2,000	5.00	10,000
	DRAINAGE EXCAVATION	CU.YD.	35,025	10.30	350,250
	BORROW	CU.YD.	3.00	60,000	180,000
	FURNISH WATER SUPPLY	MILE			
TOTAL ITEM 200					3,970,090
300 & 400	BASE AND SURFACE TREATMENT	SQ.YD.	6,537	52.40	342,528
	CONCRETE PAVEMENT	SQ.YD.	63,134	31.87	2,012,352
	ASPHALT PAVEMENT	SQ.YD.	6,537	0.00	0
	MILLING AND OVERLAY	SQ.YD.			
TOTAL ITEM 300 & 400					2,354,880
500	DRAINAGE	MILE	3.00	219,633	658,900
	ON-SITE DRAINAGE	MILE	3.00	565,918	1,697,754
	OFF-SITE DRAINAGE	EACH	0		0
	PUMP STATION	L.SUM	0		0
	OTHER:	L.SUM	0		0
TOTAL ITEM 500					2,356,654
600	STRUCTURES	SQ.FT.	81,195	130.30	10,579,725
	NUMBER OF STRUCTURES: 3	EACH	0		0
TOTAL ITEM 600					10,579,725
700	TRAFFIC ENGINEERING	L.SUM	1	840,000	840,000
	TRAFFIC CONTROL	MILE	3.00	466,512	1,399,535
	SIGNING & PAVEMENT MARKING	MILE	3.00	132,164	396,492
	LIGHTING	EACH	8	250,000	2,000,000
	TRAFFIC SIGNAL	L.SUM	1.00	532,000	532,000
	FREEWAY MANAGEMENT SYSTEM	L.SUM			
TOTAL ITEM 700					5,168,027
800	ROADSIDE DEVELOPMENT	MILE	2.00	500,000	1,000,000
	LANDSCAPING	CU.YD.	0	8.00	0
	TOPSOIL	MILE	2.00	85,000	170,000
	EROSION CONTROL	MILE	1.00	2,000,000	2,000,000
	UTILITY RELOCATION	MILE			
TOTAL ITEM 800					3,170,000
900	INCIDENTALS	L.SUM	1	3,364,000	3,364,000
	MOBILIZATION	SQ.FT.	31,700	50.00	1,585,000
	RETAINING WALLS	SQ.FT.	0	25.00	0
	SOUND WALLS	MILE	3.00	614,314	1,842,942
	ROADWAY APPURTENANCES	L.SUM	1	315,000	315,000
	CONTRACTOR QUALITY CONTROL	L.SUM	1	315,000	315,000
	CONSTRUCTION SURVEYING	L.SUM	0		0
	MISCELLANEOUS	L.SUM	0		0
		L.SUM			
		L.SUM			
TOTAL ITEM 900					7,421,942
SUBTOTAL A (ITEMS 200 THRU 900)					\$35,021,000
UNIDENTIFIED ITEMS (20% OF SUBTOTAL A)					7,004,000
SUBTOTAL B (SUBTOTAL A + UNIDENTIFIED ITEMS)					\$42,025,000
CONSTRUCTION ENGINEERING (10% OF SUBTOTAL B)					4,203,000
CONSTRUCTION CONTINGENCIES (5% OF SUBTOTAL B)					2,101,000
TOTAL ESTIMATED CONSTRUCTION COST					\$48,329,000
OTHER PROJECT COSTS					\$0
DPS TRAFFIC CONTROL					\$0
PRIOR RIGHT UTILITY RELOCATIONS AND SERVICE AGREEMENTS					\$0
JOINT PROJECT AGREEMENT ITEMS					\$0
BID ITEM PRICE ESCALATION					\$0
CONTRACTOR INCENTIVES					\$0
CONSULTANT DESIGN SERVICES (7% OF SUBTOTAL B)					\$2,942,000
OTHER (RIGHT-OF-WAY)					\$4,500,000
SUBTOTAL OTHER PROJECT COSTS (*)					\$7,442,000
TOTAL ESTIMATED PROJECT COST (*)					\$55,771,000
INDIRECT COST ALLOCATION (8.36% OF ESTIMATED COST)					4,662,000
TOTAL ESTIMATED PROJECT COST (*)					\$60,433,000

(\*) Total includes costs associated with other funding sources. See Sheet 3 of 3 for additional information.

ARIZONA DEPARTMENT OF TRANSPORTATION					
Estimate No. 6					
CONSTRUCTION COST ESTIMATE SUMMARY					
ROUTE: SR 189		PROJECT DESCRIPTION: Construct Roadway			
SEGMENT: Ultimate Condition		ESTIMATE SUMMARY LEVEL: Level 0 (15% Design)			
LENGTH: 3 MILES		TRACS NO.: 189 SC 000 H8045 01L		DATE: May 2016	
ITEM	MAJOR ITEM DESCRIPTION	UNIT	QUANTITY	UNIT COST	TOTAL COST
200	EARTHWORK	L.SUM	1	2,042,727	2,042,727
	CLEARING & REMOVALS	CU.YD.	389,648	10.00	3,896,480
	ROADWAY EXCAVATION	CU.YD.	2,000	5.00	10,000
	DRAINAGE EXCAVATION	CU.YD.	121,000	10.00	1,210,000
	BORROW	CU.YD.	3.00	60,000	180,000
	FURNISH WATER SUPPLY	MILE			
TOTAL ITEM 200					7,39,207
300 & 400	BASE AND SURFACE TREATMENT	SQ.YD.	22,579	40.62	917,150
	CONCRETE PAVEMENT	SQ.YD.	94,212	26.62	2,579,964
	ASPHALT PAVEMENT	SQ.YD.	22,579	0.00	0
	MILLING AND OVERLAY	SQ.YD.			
TOTAL ITEM 300 & 400					3,495,114
500	DRAINAGE	MILE	3.00	139,300	417,900
	ON-SITE DRAINAGE	MILE	3.00	565,918	1,697,754
	OFF-SITE DRAINAGE	EACH	0		0
	PUMP STATION	L.SUM	0		0
	OTHER:	L.SUM	0		0
TOTAL ITEM 500					2,856,654
600	STRUCTURES	SQ.FT.	185,768	139	25,799,480
	NUMBER OF STRUCTURES: 1	EACH	0		0
TOTAL ITEM 600					25,799,480
700	TRAFFIC ENGINEERING	L.SUM	1	1,516,000	1,516,000
	TRAFFIC CONTROL	MILE	3.00	564,620	1,693,860
	SIGNING & PAVEMENT MARKING	MILE	3.00	132,164	396,492
	LIGHTING	EACH	8	250,000	2,000,000
	TRAFFIC SIGNAL	L.SUM	1.00	532,000	532,000
	FREEWAY MANAGEMENT SYSTEM	L.SUM			
TOTAL ITEM 700					6,188,352
800	ROADSIDE DEVELOPMENT	MILE	2.00	500,000	1,000,000
	LANDSCAPING	CU.YD.	0	8.00	0
	TOPSOIL	MILE	2.00	85,000	170,000
	EROSION CONTROL	MILE	1.00	2,000,000	2,000,000
	UTILITY RELOCATION	MILE			
TOTAL ITEM 800					3,700,000
900	INCIDENTALS	L.SUM	1	6,039,000	6,039,000
	MOBILIZATION	SQ.FT.	105,887	50.00	5,294,350
	RETAINING WALLS	SQ.FT.	0	25.00	0
	SOUND WALLS	MILE	3.00	831,017	2,493,052
	ROADWAY APPURTENANCES	L.SUM	1	566,000	566,000
	CONTRACTOR QUALITY CONTROL	L.SUM	1	566,000	566,000
	CONSTRUCTION SURVEYING	L.SUM	0		0
	MISCELLANEOUS	L.SUM	0		0
		L.SUM			
		L.SUM			
TOTAL ITEM 900					14,958,402
SUBTOTAL A (ITEMS 200 THRU 900)					\$62,860,000
UNIDENTIFIED ITEMS (20% OF SUBTOTAL A)					12,572,000
SUBTOTAL B (SUBTOTAL A + UNIDENTIFIED ITEMS)					\$75,432,000
CONSTRUCTION ENGINEERING (10% OF SUBTOTAL B)					7,543,000
CONSTRUCTION CONTINGENCIES (5% OF SUBTOTAL B)					3,771,000
TOTAL ESTIMATED CONSTRUCTION COST					\$86,746,000
OTHER PROJECT COSTS					\$0
DPS TRAFFIC CONTROL					\$0
PRIOR RIGHT UTILITY RELOCATIONS AND SERVICE AGREEMENTS					\$0
JOINT PROJECT AGREEMENT ITEMS					\$0
BID ITEM PRICE ESCALATION					\$0
CONTRACTOR INCENTIVES					\$0
CONSULTANT DESIGN SERVICES (7% OF SUBTOTAL B)					\$5,292,000
OTHER (RIGHT-OF-WAY)					\$31,000,000
SUBTOTAL OTHER PROJECT COSTS (*)					\$36,672,000
TOTAL ESTIMATED PROJECT COST (*)					\$123,444,000
INDIRECT COST ALLOCATION (13.6% OF ESTIMATED COST)					10,222,000
TOTAL ESTIMATED PROJECT COST (*)					\$133,766,000

(\*) Total includes costs associated with other funding sources. See Sheet 3 of 3 for additional information.

ARIZONA DEPARTMENT OF TRANSPORTATION					
Estimate No. 7					
CONSTRUCTION COST ESTIMATE SUMMARY					
ROUTE: SR 189		PROJECT DESCRIPTION: Construct Roadway			
SEGMENT: Phased Ultimate		ESTIMATE SUMMARY LEVEL: Level 0 (15% Design)			
LENGTH: 3 MILES		TRACS NO.: 189 SC 000 H8045 01L		DATE: May 2016	
ITEM	MAJOR ITEM DESCRIPTION	UNIT	QUANTITY	UNIT COST	TOTAL COST
200	EARTHWORK	L.SUM	1	703,263	703,263
	CLEARING & REMOVALS	CU.YD.	67,350	10.00	673,500
	ROADWAY EXCAVATION	CU.YD.	0	5.00	0
	DRAINAGE EXCAVATION	CU.YD.	311,875	10.00	3,118,750
	BORROW	CU.YD.	3.00	60,000	180,000
	FURNISH WATER SUPPLY	MILE			
TOTAL ITEM 200					4,705,513
300 & 400	BASE AND SURFACE TREATMENT	SQ.YD.	11,214	47.02	574,328
	CONCRETE PAVEMENT	SQ.YD.	4,326	36.08	1,743,562
	ASPHALT PAVEMENT	SQ.YD.	4,326	0.00	0
	MILLING AND OVERLAY	SQ.YD.			
TOTAL ITEM 300 & 400					2,317,890
500	DRAINAGE	MILE	0.50	462,480	231,240
	ON-SITE DRAINAGE	MILE	0.50	0	0
	OFF-SITE DRAINAGE	EACH	0		0
	PUMP STATION	L.SUM	1		0
	OTHER:	L.SUM	0		0
TOTAL ITEM 500					231,240
600	STRUCTURES	SQ.FT.	115,085	141.66	16,444,900
	NUMBER OF STRUCTURES: 1	EACH	0		0
TOTAL ITEM 600					16,444,900
700	TRAFFIC ENGINEERING	L.SUM	1	792,000	792,000
	TRAFFIC CONTROL	MILE	3.00	703,333	2,110,000
	SIGNING & PAVEMENT MARKING	MILE	3.00	132,164	396,492
	LIGHTING	EACH	0		0
	TRAFFIC SIGNAL	EACH	0		0
	FREEWAY MANAGEMENT SYSTEM	MILE	0.00	532,000	0
TOTAL ITEM 700					3,298,492
800	ROADSIDE DEVELOPMENT	MILE	0.50	500,000	250,000
	LANDSCAPING	CU.YD.	0	8.00	0
	TOPSOIL	MILE	0.50	85,000	42,500
	EROSION CONTROL	MILE	0.50	2,000,000	1,000,000
	UTILITY RELOCATION	MILE	0.50	2,000,000	1,000,000
TOTAL ITEM 800					1,292,500
900	INCIDENTALS	L.SUM	1	3,167,000	3,167,000
	MOBILIZATION	SQ.FT.	0	50.00	0
	RETAINING WALLS	SQ.FT.	0	25.00	0
	SOUND WALLS	MILE	0.64	1,491,344	954,460
	ROADWAY APPURTENANCES	L.SUM	1	297,000	297,000
	CONTRACTOR QUALITY CONTROL	L.SUM	1	297,000	297,000
	CONSTRUCTION SURVEYING	L.SUM	0		0
	MISCELLANEOUS	L.SUM	0		0
		L.SUM			
		L.SUM			
TOTAL ITEM 900					\$4



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**Appendix E. Alternatives Development and Screening, Stage I**

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Evaluation category	Proposed criteria		Proposed approach	Build Alternative						No-build
				Corridor management		Expressway		Connector route		
				Score	Notes	Score	Notes	Score	Notes	
Traffic operations	1	Travel time/travel speed	Midday peak period travel time between the Mariposa POE and I-19/Mariposa Road TI	3	- 18 mph average travel speed - 9.67 minute travel time/2.9 miles	4	- Assumes only northbound and southbound POE traffic to/from I-19 use expressway - Local traffic uses frontage roads - LOS A - 60 mph average travel speed - 2.9 minute travel time/2.9 miles	4	- Assumes only northbound and southbound POE traffic from I-19 and Centro Commercial - LOS B - 57 mph average travel speed - 2.9 minute average travel time/2.8 miles	- 12 mph average travel speed - 14 minute travel time/2.9 miles
	2	Reduce vehicle conflicts	Qualitative assessment of access consolidation, elimination or consolidation of driveways, and reduction of conflict points compared to the no-build alternative	3	- Improve existing SR 189 corridor - Implement access management strategies - Intersection improvements	4	- Expressway assumes access-controlled route to I-19 - Access to one-way frontage road system from adjacent land uses may be consolidated - Grade separated intersections at some locations	2	- No change to existing access on SR 189 - Connector route assumes access-controlled route to I-19 - No reduction to vehicle conflicts on existing SR 189	- No change to existing access
		Sub-Total (Average)		3.0		4.0		3.0		
Implementation	3	Phasing and impacts to adjacent businesses	Assessment of the implementation opportunities and constraints for each corridor alternative would be measured by considering construction duration, construction phasing, potential roadway closures, and impacts on existing traffic	5	- Spot improvements have shorter construction duration and immediate traffic operations benefits - Spot improvements reduce potential for road closures. No new bridge structures are proposed over SR 189 which further reduces the possibility of road closures - Impacts on existing traffic are minimized. This corridor alternative would have an at-grade profile which would assist in maintaining access to properties located along the corridor - Flexible implementation since the access management opportunities can be prioritized by identifying the critical locations for spot improvements	2	- Longer construction duration due to construction of a grade separated expressway and new frontage roads - The possibility of road closures are high due to full reconstruction of SR 189. - New bridge structures are proposed over SR 189 which further increases the possibility of road closures - Impacts on existing traffic are increased. This corridor alternative would have a barrier separated expressway that would modify the existing circulation in the area	3	- Longer construction duration due to construction through mountainous terrain - The possibility of road closures are low since construction activities would be focused on the route connections to SR 189 and I-19 - Impacts on existing traffic are minimized or eliminated since this alternative is a new route with no existing access points to be maintained - No existing road or access point that will need to be maintained	- No construction impact
		Sub-Total (Average)		5		2		3		
Environmental impacts	4	Biological resources	Assess presence/impacts to threatened and endangered species, critical habitat, state sensitive species, and protected native plants	3	- Potential impact on Pima pineapple cactus - Requires assessment of habitat for other listed species - Potential impact on protected native plants	3	- Potential impact on Pima pineapple cactus - Requires assessment of habitat for other listed species - Potential impact on protected native plants	2	- Potential impact on Pima pineapple cactus - Impact on undeveloped land would affect greater number of wildlife and plant species - Potential impact on protected native plant species	-No impact on biological resources beyond typical maintenance

Evaluation category	Proposed criteria		Proposed approach	Build Alternative						No-build
				Corridor management		Expressway		Connector route		
				Score	Notes	Score	Notes	Score	Notes	Notes
Environmental impacts	5	Cultural resources	Assess impact on known archaeological and cultural resource sites	3	- Could affect one archaeological site	3	- Could affect one archaeological site	2	- Could affect one archaeological site; could indirectly affect historical district and other historic properties; much more additional survey needed than other alternatives - Potential indirect affects to the Crawford Historic District and Nogales Multiple Resource Area	- No impact on cultural resources
	6	Floodplains and water resources	Assess impact to floodplains, wetlands, riparian areas, and involvement with Section 404 resources	4	- Existing bridged crossing of floodway/potential waters of the U.S. at two locations - Bridge widening at one location	3	- Existing bridged crossing of floodway/potential waters of the U.S. at two locations - Bridge widening at two locations	1	- New crossing of floodway/potential waters of the U.S. - Flood Insurance Rate Map (FIRM) update required - Greatest potential impact to waters of the U.S.	-No impact on floodplains and water resources
	7	Section 4(f) and 6(f)	Section 4(f) resources within 0.25 miles of the alternatives or where access may be of concern	4	- Nogales High School (0.07 miles)	4	- Nogales High School (0.05 miles)	3	- Camp Little Park (0.25 miles) - Mary L. Welty Elementary School (0.03 miles) - Nogales High School (0.04 miles) - Potential visual impact Nogales MRA Crawford Hill Historic District (0.01 miles)	- No impacts to Section 4(f) resources
	8	Soils and topography	Assessment of soils, topography/geology for impacts and fatal flaws		- No limiting impacts or fatal flaws - No impacts on existing developed landforms		- No limiting impacts or fatal flaws - No impacts on existing developed landforms		- Impacts on undeveloped native soils and topography - Impacts on alluvial fan slopes and drainages - No fatal flaws	- No limiting impacts or fatal flaws - No impacts on existing developed landforms
	9	Prime and unique farmland	Acreage of farmland in the alternatives		- No farmland		- No farmland		- No farmland	- No farmland
	10	Visual resources	Evaluate proposed facility form, line, color, and location in relation to existing facilities and development and assess anticipated changes to the visual character. Determine if there are key viewpoints from residential, recreational, or other important areas	4	- Impacts would be primarily at intersections but would be consistent with existing visual character - Impacts anticipated to be low both from the road and to the road	3	- Access controlled roadway and parallel collector-distributor road system would increase the visual footprint of the roadway - Visual character anticipated to remain the same due to existing level and type of development	2	- Potential for new visual impacts close to residential neighborhoods - Potential for additional views of cut slopes - New roadway in undeveloped area	-No impact on visual resources
	11	Title VI/Environmental Justice	Evaluate census tract data within the project area as compared to the City of Nogales and Santa Cruz County		- No disproportionate impacts on minority and environmental justice populations		- No disproportionate impacts on minority and environmental justice populations		- No disproportionate impacts on minority and environmental justice populations	- No disproportionate impacts on minority and environmental justice populations
	12	Hazardous materials	Review of regulatory data to determine the density and location of potential sites	2	- Potential for high density of hazardous materials sites	3	- Potential for moderate density of hazardous materials sites	4	- Low potential for hazardous materials sites	- No impacts to hazardous materials sites



Evaluation category	Proposed criteria		Proposed approach	Build Alternative						No-build
				Corridor management		Expressway		Connector route		
				Score	Notes	Score	Notes	Score	Notes	
Environmental impacts	13	Air quality	Prepare quantitative particulate matter hot-spot analysis for PM <sup>10</sup> and PM <sup>2.5</sup> , and level 2 qualitative MSAT evaluation		- No discernable differences between alternatives		- No discernable differences between alternatives		- No discernable differences between alternatives	- No air quality or transportation conformity issues
	14	Noise	Prepare noise analysis to evaluate impacts to nearby residential, school, and hospital land uses	3	- Nogales High School (0.07 miles)	3	- Nogales High School (0.07 miles)	2	- Camp Little Park (0.25 miles) - Mary L. Welty Elementary School (0.03 miles) - Nogales High School (0.04 miles)	- No noise impacts
		Sub-Total (Average)		3.3		3.1		2.3		
Cost	15	Construction costs	Assessment of overall corridor costs	5	- \$55.5 million (planning level costs)	1	- \$150 million (planning level costs)	2	- \$120 million (planning level costs)	- \$0
	16	Land cost	Assessment of the amount of new right-of-way required for the corridor alternatives. Alternatives that require the least amount of new right-of-way indicates a higher rating and an assessment of potential for full or partial takes	4	- Least right-of-way required - Improvements may avoid full right-of-way takes from residences and businesses	2	- New right-of-way would be added to the existing SR 189 corridor between the Mariposa POE and I-19 for expressway and frontage road footprint - Potential for full and partial right-of-way takes from residences and businesses	3	- New corridor right-of-way would be required between SR 189 and I-19 for the connector route footprint	- No right-of-way impacts
		Sub-Total (Average)		4.5		1.5		2.5		
Regional plan consistency	17	Assessment of compatibility with adopted plans	Qualitative assessment of compatibility with adopted transportation plans	5	- Improvements to the existing corridor is Mariposa / I-19 Connector Route Study preferred alternative - Unified Nogales Santa Cruz County Transportation Plan recommends widening and improvement - Alternative would support anticipated growth in local traffic	4	- Improvements to the existing corridor is Mariposa / I-19 Connector Route Study preferred alternative - Unified Nogales Santa Cruz County Transportation Plan recommends widening and improvement but does not address expressways - Alternative would support anticipated growth of local traffic	2	- Not supported by Mariposa / I-19 Connector Route Study - Not supported by Unified Nogales Santa Cruz County Transportation Plan - Alternative would not directly support anticipated growth of local traffic	- Not supported by Mariposa / I-19 Connector Route Study - Not supported by Unified Nogales Santa Cruz County Transportation Plan - No build would not support anticipated growth of local traffic
		Sub-Total (Average)		5		4		2		
Stakeholder preference	18	Nogales, Santa Cruz County	Preference of corridor alternative	5	- Concern about operations at Frank Reed Road - Stakeholders have passed resolutions in support of the corridor management alternative	1	- Concern about construction access	1	- Concern travelers may not shop in Nogales	
	19	Community	Preference of corridor alternative	3	- Conflicts exist between truck traffic and local traffic	3	- Expressway may keep travelers from shopping in Nogales	3	- Could inhibit development in SR 189 corridor	
		Sub-Total (Average)		4.0		2.0		2.0		

Total of Averages

24.8

16.6

14.8

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Appendix F. Alternatives Development and Screening, Stage II

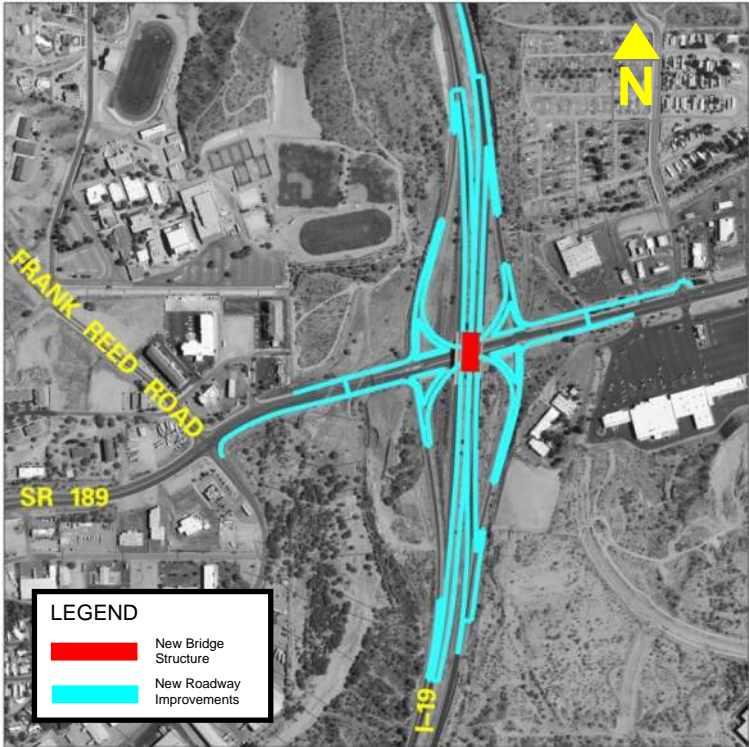
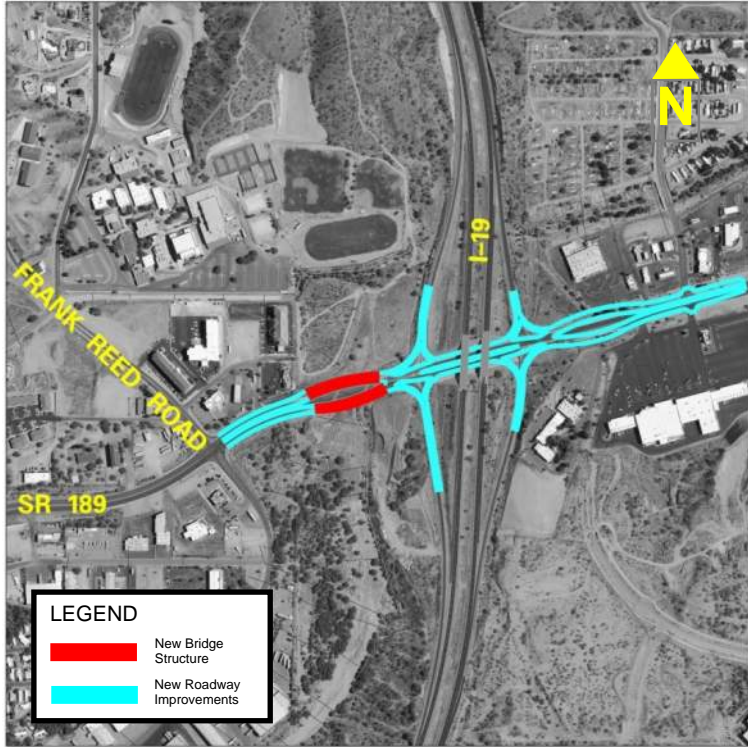
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	DIAMOND WITH FLYOVER		DIAMOND WITH FLYOVER AND SE LOOP RAMP	
	Option A		Option B	
Figure	<p>Figure A: Diamond with Flyover. This aerial map shows the intersection of Frank Reed Road (SR 189) and I-19. A red line highlights the new bridge structure, and a cyan line shows the new roadway improvements. A yellow arrow indicates North (N).</p>		<p>Figure B: Diamond with Flyover and SE Loop Ramp. This aerial map shows the intersection of Frank Reed Road (SR 189) and I-19. A red line highlights the new bridge structure, and a cyan line shows the new roadway improvements. A yellow arrow indicates North (N).</p>	
Key Features	<ul style="list-style-type: none"> <li>- Provides SR189 EB trucks west of Frank Reed Road the opportunity to bypass the traffic signal to head NB on I-19.</li> </ul>		<ul style="list-style-type: none"> <li>- Provides SR189 EB trucks west of Frank Reed Road the opportunity to bypass the traffic signal to head NB on I-19.</li> <li>- SB I-19 trucks that wish to go EB on SR 189 will be able to bypass the left turn movement by taking the SE loop ramp to access Grand Avenue.</li> </ul>	



	DIAMOND WITH INSIDE FLYOVER	DIAMOND WITH INSIDE FLYOVER AND GRADE SEPARATION AT FRANK REED ROAD
	Option C	Option D
Figure	<p>Figure C is an aerial map showing the proposed infrastructure for Option C. It features Frank Reed Road (SR 189) and I-19. A red line represents the new bridge structure, and a cyan line represents new roadway improvements. A yellow arrow points North (N). The map shows the intersection area with the proposed improvements.</p>	<p>Figure D is an aerial map showing the proposed infrastructure for Option D. It features Frank Reed Road (SR 189) and I-19. A red line represents the new bridge structure, and a cyan line represents new roadway improvements. A yellow arrow points North (N). The map shows the intersection area with the proposed improvements, including grade separation at Frank Reed Road.</p>
Key Features	<ul style="list-style-type: none"> <li>- Provides SR189 EB trucks west of Frank Reed Road the opportunity to bypass the traffic signal to head NB on I-19.</li> <li>- Minimizes footprint over Mariposa Canyon Wash.</li> </ul>	<ul style="list-style-type: none"> <li>- Provides SR189 EB trucks the opportunity to bypass the traffic signal at Frank Reed Road to head NB on I-19.</li> <li>- Minimizes footprint over Mariposa Canyon Wash.</li> </ul>

	SINGLE POINT URBAN INTERCHANGE (SPUI)	DIVERGING DIAMOND INTERCHANGE (DDI)
	Option E	Option F
Figure	 <p>Figure</p>	
Key Features	<ul style="list-style-type: none"> <li>- Improved traffic operation through the use of a single signal to control the entire interchange.</li> </ul>	<ul style="list-style-type: none"> <li>- This interchange configuration allows for two-phase operation at the intersections. The left turn movements are eliminated to improve the efficiency of the interchange.</li> </ul>

Evaluation category	Proposed criteria		Proposed approach	MARIPOSA TRAFFIC INTERCHANGE STAGE II EVALUATION											
				DIAMOND WITH FLYOVER		DIAMOND WITH FLYOVER AND SE LOOP RAMP		DIAMOND WITH INSIDE FLYOVER		DIAMOND WITH INSIDE FLYOVER AND GRADE SEPARATION AT FRANK REED ROAD		SINGLE POINT URBAN INTERCHANGE (SPUI)		DIVERGING DIAMOND INTERCHANGE (DDI)	
				Score	Option A	Score	Option B	Score	Option C	Score	Option D	Score	Option E	Score	Option F
Traffic operations	1A	Intersection operations	Intersection level of service along the SR 189 corridor. 17 intersections were evaluated. Higher level of service indicates better performance.	3	<b>Mid-day peak hour:</b> 7 intersections at LOS A/B 7 intersections at LOS C/D 2 intersection at LOS E/F 1 unknown <b>PM Peak hour:</b> 9 intersections at LOS A/B 6 intersections at LOS C/D 1 intersection at LOS E/F 1 unknown	3	<b>Mid-day peak hour:</b> 7 intersections at LOS A/B 7 intersections at LOS C/D 2 intersection at LOS E/F 1 unknown <b>PM Peak hour:</b> 9 intersections at LOS A/B 6 intersections at LOS C/D 1 intersection at LOS E/F 1 unknown	1	<b>Mid-day peak hour:</b> 7 intersections at LOS A/B 7 intersections at LOS C/D 2 intersection at LOS E/F 1 unknown <b>PM Peak hour:</b> 9 intersections at LOS A/B 5 intersections at LOS C/D 2 intersection at LOS E/F 1 unknown	5	<b>Mid-day peak hour:</b> 8 intersections at LOS A/B 7 intersections at LOS C/D 1 intersection at LOS E/F 1 unknown <b>PM Peak hour:</b> 9 intersections at LOS A/B 6 intersections at LOS C/D 1 intersection at LOS E/F 1 unknown	1	<b>Mid-day peak hour:</b> 7 intersections at LOS A/B 7 intersections at LOS C/D 2 intersection at LOS E/F 1 unknown <b>PM Peak hour:</b> 9 intersections at LOS A/B 5 intersections at LOS C/D 2 intersection at LOS E/F 1 unknown	1	<b>Mid-day peak hour:</b> 7 intersections at LOS A/B 7 intersections at LOS C/D 2 intersection at LOS E/F 1 unknown <b>PM Peak hour:</b> 9 intersections at LOS A/B 5 intersections at LOS C/D 2 intersection at LOS E/F 1 unknown
	1B	Ramp operations	Ramp intersection level of service at the traffic interchange. 2 intersections were evaluated. Higher level of service indicates better performance.	3	<b>Mid-day peak hour:</b> 0 intersections at LOS A/B 2 intersections at LOS C/D 0 intersection at LOS E/F <b>PM Peak hour:</b> 1 intersections at LOS A/B 1 intersections at LOS C/D 0 intersection at LOS E/F	5	<b>Mid-day peak hour:</b> 0 intersections at LOS A/B 2 intersections at LOS C/D 0 intersection at LOS E/F <b>PM Peak hour:</b> 2 intersections at LOS A/B 0 intersections at LOS C/D 0 intersection at LOS E/F	3	<b>Mid-day peak hour:</b> 0 intersections at LOS A/B 2 intersections at LOS C/D 0 intersection at LOS E/F <b>PM Peak hour:</b> 1 intersections at LOS A/B 1 intersections at LOS C/D 0 intersection at LOS E/F	3	<b>Mid-day peak hour:</b> 0 intersections at LOS A/B 2 intersections at LOS C/D 0 intersection at LOS E/F <b>PM Peak hour:</b> 0 intersections at LOS A/B 2 intersections at LOS C/D 0 intersection at LOS E/F	1	<b>Mid-day peak hour:</b> 0 intersections at LOS A/B 0 intersections at LOS C/D 2 intersection at LOS E/F <b>PM Peak hour:</b> 0 intersections at LOS A/B 2 intersections at LOS C/D 0 intersection at LOS E/F	2	<b>Mid-day peak hour:</b> 0 intersections at LOS A/B 2 intersections at LOS C/D 0 intersection at LOS E/F <b>PM Peak hour:</b> 0 intersections at LOS A/B 2 intersections at LOS C/D 0 intersection at LOS E/F
	1C	Travel time/travel speed	Average intersection delay in the corridor. Lower average intersection delay indicates better performance.	4	Compared to the other TI options, this option had moderate intersection delays for the corridor. Mid-day average intersection delay is 27.1 seconds. PM average intersection delay is 21.4 seconds.	4	Compared to the other TI options, this option had moderate intersection delays for the corridor. Mid-day average intersection delay is 26.2 seconds. PM average intersection delay is 21.6 seconds.	2	Compared to the other TI options, this option had moderate intersection delays for the corridor. Mid-day average intersection delay is 27.3 seconds. PM average intersection delay is 25.1 seconds.	5	Compared to the other TI options, this option had the lowest intersection delays for the corridor. Mid-day average intersection delay is 24.4 seconds. PM average intersection delay is 21.3 seconds.	1	Compared to the other TI options, this option had the highest intersection delays for the corridor. Mid-day average intersection delay is 28.5 seconds. PM average intersection delay is 25.3 seconds.	2	Compared to the other TI options, this option had moderate intersection delays for the corridor. Mid-day average intersection delay is 26.5 seconds. PM average intersection delay is 25.7 seconds.
		Sub-Total (Average)		3.3		4.0		2.0		4.3		1.0		1.7	
Pedestrian and bicycle travel	2	Ease of movement through intersection	Assessment of pedestrian and bicycle circulation through the interchange. Minimal restrictions to pedestrian and bicycle circulation indicates better performance.	1	Pedestrian movement may need to be restricted to the north side of SR 189 but may be mitigated.	1	Pedestrian movement may need to be restricted to the north side of SR 189 but may be mitigated.	5	Pedestrian movement allowed for both north and south side of SR 189.	5	Pedestrian movement allowed for both north and south side of SR 189.	3	Pedestrian movement allowed for both north and south side of SR 189. Additional cross walk locations required	2	Pedestrian movement allowed for both north and south side of SR 189. Additional cross walk locations required
		Sub-Total (Average)		1.0		1.0		5.0		5.0		3.0		2.0	
Route continuity	3	Ability of vehicles to go through or reverse directions	Assessment of how vehicles can continue on I-19 through the proposed interchange. The ability for vehicles to continue on I-19 or reverse directions through the interchange alternative indicates better performance.	5	Vehicles can continue on I-19 through the proposed TI or reverse directions.	5	Vehicles can continue on I-19 through the proposed TI or reverse directions.	5	Vehicles can continue on I-19 through the proposed TI or reverse directions.	5	Vehicles can continue on I-19 through the proposed TI or reverse directions.	1	Vehicles will have restrictions to continue on I-19 through the proposed TI. Vehicles can reverse directions on I-19 through the proposed TI.	1	Vehicles will have restrictions to continue on I-19 through the proposed TI. Vehicles can reverse directions on I-19 through the proposed TI.
		Sub-Total (Average)		5.0		5.0		5.0		5.0		1.0		1.0	
Environmental impacts	4A	Cultural resources	Assessment of interchange impact on known cultural resources sites. No impacts to sites indicates better performance.	1	Impacts NRHP-eligible archaeological site	1	Impacts NRHP-eligible archaeological site	3	May or may not impact NRHP-eligible site; field investigation required	3	May or may not impact NRHP-eligible site; field investigation required	1	Impacts NRHP-eligible archaeological site	4	No impacts to known cultural resources (survey may be required resulting in discovery)
	4B	Floodplains and water resources	longitudinal wash crossings introduce greater impacts than perpendicular crossings, or bridges.	3	Longitudinal crossings of washes in the NE quadrant of the TI	1	Longitudinal crossings of washes in the NE quadrant of the TI. More extensive reconfiguration of the TI; therefore, more potential for impacts (especially on the west side of the TI)	2	Improvements may extend outside existing roadway footprint due to bridge widening.	4	Improvements are within the existing roadway footprint; therefore minimal impact, if any.	4	Improvements are within the existing roadway footprint; therefore minimal impact, if any.	2	Improvements may extend outside existing roadway footprint due to bridge widening.

Evaluation category	Proposed criteria		Proposed approach	MARIPOSA TRAFFIC INTERCHANGE STAGE II EVALUATION											
				DIAMOND WITH FLYOVER		DIAMOND WITH FLYOVER AND SE LOOP RAMP		DIAMOND WITH INSIDE FLYOVER		DIAMOND WITH INSIDE FLYOVER AND GRADE SEPARATION AT FRANK REED ROAD		SINGLE POINT URBAN INTERCHANGE (SPUI)		DIVERGING DIAMOND INTERCHANGE (DDI)	
				Score	Option A	Score	Option B	Score	Option C	Score	Option D	Score	Option E	Score	Option F
Environmental impacts	4C	Section 4(f) and 6(f)	No direct or constructive uses are anticipated. Proximity impacts may vary depending on how close the roadway is to Section 4(f) resources. There are no known historic Section 4(f) resources that would be impacted by the TI.	5	No changes to the roadway adjacent to Nogales High School	4	No direct use. Option B is adjacent to Nogales High School and likely to have the most proximity impacts. Unlikely there will be constructive use of the resource	5	No changes to the roadway adjacent to Nogales High School	5	No changes to the roadway adjacent to Nogales High School	5	Changes to the roadway adjacent to Nogales High School are within the existing roadway footprint.	5	Changes to the roadway adjacent to Nogales High School are within the existing roadway footprint.
	4D	Visual resources	Flyovers are more visually intrusive than at-grade roadway features; internal flyovers less so than outside flyovers.	2	Outside flyover	2	Outside flyover, but more extensive reconfiguration of the TI which introduces more and different elements	3	Inside flyover	3	Inside flyover, but elevated over the greatest distance of any of the alternatives	5	All proposed roadway elements match existing roadway grade. Proposed elements are within the current roadway footprint	5	All proposed roadway elements match existing roadway grade. match existing roadway grade. Proposed elements are within the current roadway footprint
	4E	Hazardous materials	The greater the number of known hazardous materials sites within the proposed footprints, the greater the potential impact.	3	Three hazardous materials sites within proposed TI footprint	3	Three hazardous materials sites within proposed TI footprint	4	Two hazardous materials sites within the proposed TI footprint	2	Four hazardous materials sites within the proposed TI footprint	3	Three hazardous materials sites within the proposed TI footprint	3	Three hazardous materials sites within the proposed TI footprint
	4F	Noise	Proximity of noise generators to residences and business would be considered to have a greatest impact. Additionally, the higher roadway structures would also increase noise exposure to residences and businesses	2	Higher potential noise impacts due to flyover. Roadway is closer to residents and businesses than existing condition.	1	Higher potential noise impacts due to flyover. Roadway is closer to residents and businesses than existing condition. This option scores lower than Option A because its proximity to Nogales High School.	3	Higher potential noise impacts due to flyover. Flyover is inside the existing roadway footprint; therefore, it's distance to residents and businesses remains similar to existing.	2	Although this option is essentially within the existing roadway footprint, it is elevated for a much longer distance than the other options, increasing noise exposure to noise receptors.	5	Within existing roadway footprint and no changes to existing grade	5	Within existing roadway footprint and no changes to existing grade
		Sub-Total (Average)		2.7		2.0		3.3		3.2		3.8		4.0	
Cost	5A	Bridge Structures	Assessment of the locations and types of structures required to support the interchange alternative. A reduction in the amount of bridge required indicates a higher rating.	3	1) New bridge structure over I-19 for the flyover (Length=2000'); 2) Widening to the south of existing bridge structure over Mariposa Canyon Wash	2	1) New bridge structure over I-19 for the flyover (Length=2000'); 2) Widening to the south of existing bridge structure over Mariposa Canyon Wash; 3) SE loop ramp bridge structure over SR 189 (Length=200')	3	1) Modification or reconstruction of existing bridge over Mariposa Canyon Wash to accommodate retaining walls and flyover ramp (Length=300'); 2) New bridge structure over I-19 for the flyover (Length=1200')	1	1) Modification or reconstruction of existing bridge over Mariposa Canyon Wash to accommodate retaining walls and flyover ramp (Length=300'); 2) New bridge structure over Frank Reed Road intersection and I-19 for the flyover (Length=3800')	3	1) New single span I-19 bridge structure required over SR 189 (Length=250')	4	1) Modification or reconstruction of existing bridge over Mariposa Canyon Wash
	5B	Retaining Walls	Assessment of the locations and types of structures required to support the interchange alternative. A reduction in the amount of retaining walls required indicates a higher rating.	4	Minimal to no retaining walls required.	4	Minimal to no retaining walls required.	3	Moderate amount of retaining walls required due to inside flyover ramp structure.	1	High amount of retaining walls required due to grade separation west of Frank Reed Road intersection.	5	Minimal to no retaining walls required.	5	Minimal to no retaining walls required.
	5C	Evaluate the amount of right-of-way required	Assessment of the amount of new right-of-way required for the interchange alternatives. Alternatives that require the least amount of new right-of-way indicate a higher rating.	2	New R/W required along SR 189 and I-19 due to flyover.	1	New R/W required along SR 189 and I-19 due to flyover and the reconfiguration of the SB ramps.	5	Additional R/W may not be required.	5	Additional R/W may not be required.	4	Layout would likely fit within the existing R/W.	2	Additional R/W may be required along SR-189 on either side of I-19 as the layout bulges out from existing.
		Sub-Total (Average)		3.0		2.3		3.7		2.3		4.0		3.7	



Evaluation category	Proposed criteria		Proposed approach	MARIPOSA TRAFFIC INTERCHANGE STAGE II EVALUATION											
				DIAMOND WITH FLYOVER		DIAMOND WITH FLYOVER AND SE LOOP RAMP		DIAMOND WITH INSIDE FLYOVER		DIAMOND WITH INSIDE FLYOVER AND GRADE SEPARATION AT FRANK REED ROAD		SINGLE POINT URBAN INTERCHANGE (SPUI)		DIVERGING DIAMOND INTERCHANGE (DDI)	
				Score	Option A	Score	Option B	Score	Option C	Score	Option D	Score	Option E	Score	Option F
Implementation	6A	Construction Phasing	Assessment of the implementation opportunities and constraints for each TI alternative would be measured by how the alternative can be phased to provide shorter construction durations.	5	Potentially shorter construction durations due to most activities occurring outside the existing roadway footprint. Most construction activities can occur under live traffic.	5	Potentially shorter construction durations due to most activities occurring outside the existing roadway footprint. Most construction activities can occur under live traffic.	3	Potentially moderate construction durations due to detours required for retaining wall and flyover construction along SR-189.	1	Potentially long construction durations due to detours required for retaining wall and flyover construction. NB and SB movements through the Frank Reed Road intersection will require detours or closures due to grade separated structure construction.	2	Potentially long construction durations due to detours required for removal and construction of the I-19 mainline bridge. Potential re-profiling of I-19 may be required to provided minimum vertical clearance on SR 189.	2	Potential mainline or ramp closures not anticipated. Potentially shorter construction durations due to most activities occurring outside the existing roadway footprint. However, re-striping and signing the DDI could potentially increase construction durations.
	6B	Construction impacts to adjacent businesses	Assessment of the implementation opportunities and constraints for each corridor alternative would be measured by considering impacts to adjacent businesses due to potential roadway closures and impacts on existing traffic	4	Potential mainline or ramp closures at 5 locations. Impacts to existing driveways before and after construction are not anticipated.	3	Potential mainline or ramp closures at 5 locations. Impacts to existing driveways before and after construction are not anticipated.	2	Potential mainline or ramp closures at 3 locations. Existing driveway east of Frank Reed Road will need to be revised as a right-in/right-out.	1	Potential mainline or ramp closures at 4 locations. Existing driveway east of Frank Reed Road will need to be revised as a right-in/right-out. Businesses west of Frank Reed Road will only have right-in/right-out access due to inside ramp entrance.	2	Potential mainline or ramp closures at 1 location. Impacts to existing driveways before and after construction are not anticipated.	2	Potential mainline or ramp closures not anticipated. Impacts to existing driveways are anticipated east and west of I-19.
		Sub-Total (Average)		4.5		4.0		2.5		1.0		2.0		2.0	
Design considerations	7A	Ramp grades	Assessment of profile grades for ramps. 3% grade or less is desirable.	3	Approximately 4% grade at flyover ramp entrance.	3	Approximately 4% grade at flyover ramp entrance.	1	Approximately 5.2% grade at flyover ramp entrance.	4	Approximately 3% grade at flyover ramp entrance.	4	Alternative matches existing ramp grades.	5	Alternative matches existing ramp grades.
	7B	Driver Expectancy	Assessment of general expectations of the public for the corridor. Assumes that the drivers are anticipating a standard diamond TI that is consistent with the majority of the TIs within the corridor.	5	TI configuration and flyover ramp location is consistent with other TIs in the corridor.	4	TI configuration and flyover ramp location is consistent with other TIs in the corridor. This alternative contains a loop ramp that provides an additional movement from SB I-19 to EB SR 189 that will require additional signage.	2	TI configuration is consistent with other TIs in the corridor. The inside entrance/exit flyover ramp at SR 189 and I-19 is not typical of the corridor.	2	TI configuration is consistent with other TIs in the corridor. The inside entrance/exit flyover ramp at SR 189 and I-19 is not typical of the corridor.	3	TI configuration is not consistent with other TIs in the corridor but is still pretty similar to a diamond TI.	1	TI configuration is not consistent with other TIs in the corridor.
	7C	Weaving distance along SR189	Assessment of weaving distance from the Frank Reed Road/SR 189 intersection to I-19 entrance ramps. Desirable weaving distance is 1000'.	1	Desirable weaving distance for EB SR 189 to NB I-19 is 1000'. 450' provided.	1	Desirable weaving distance for EB SR 189 to NB I-19 is 1000'. 450' provided.	1	Desirable weaving distance for EB SR 189 to NB I-19 is 1000'. 450' provided.	5	Desirable weaving distance is met.	5	Desirable weaving distance is met.	5	Desirable weaving distance is met.
		Sub-Total (Average)		3.0		2.7		1.3		3.7		4.0		3.7	
Stakeholder and Public Input	8A	Stakeholder	Assesment of the support for the TI alternative	5	Support for this alternative and for alternative D or maybe a hybrid of the two.	3	Neutral support	3	Potential conflicts with high school kids at the Frank Reed Road intersection.	5	This option would get the trucks away from the high school kids. Support for this alternative and for alternative A or maybe a hybrid of the two.	3	Neutral support	3	Neutral support
	8B	Agency	Assesment of the support for the TI alternative	3	Neutral support	3	Neutral support	3	Neutral support	3	Neutral support	3	Neutral support	3	Neutral support
	8C	Community	Assesment of the support for the TI alternative	5	Best option for the increase of the trucking industry.	5	Will address exiting and entering I-19 traffic and is safer for the produce trucks.	5	Support for this alternative along with related improvemnts between SR 189 and Frank Reed Road.	5	This option will cut down congestion, eliminates the mix of pedestrian and vehicle conflicts, and reduces the mix of commercial and inexperienced drivers at Frank Reed Road.	3	Neutral support	5	This option appears to be the best improvement versus cost option.
		Sub-Total (Average)		4.3		3.7		3.7		4.3		3.0		3.7	
Total of Averages				26.8		24.7		26.5		28.8		21.8		21.7	



Appendix G. Traffic and Safety Files

Available upon request

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